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THE BLAST NOISE PREDICTION PROGRAM: USER REFERENCE MANUAL.(U)
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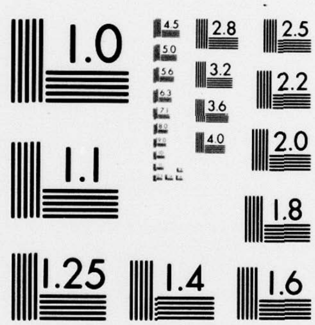
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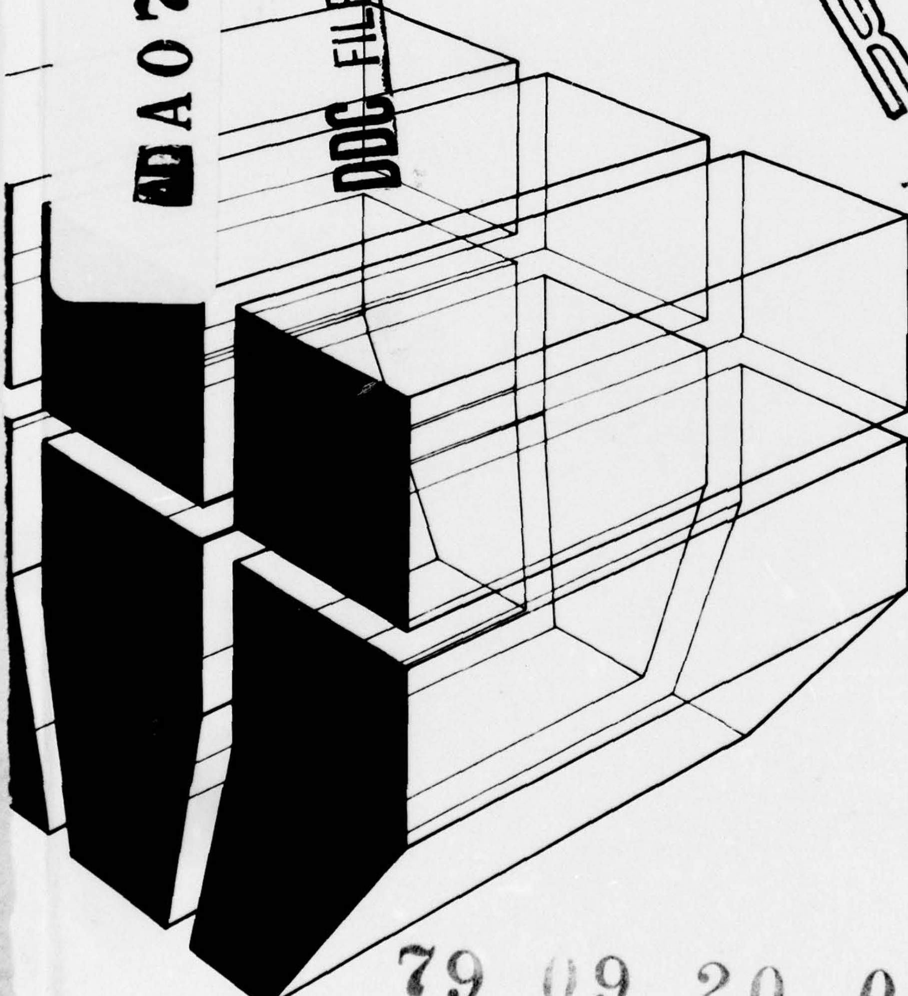
THE BLAST NOISE PREDICTION PROGRAM: USER REFERENCE MANUAL



by
V. Pawlowska
L. Little

CERL

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THIS REPORT DESCRIBES A COMPUTER-BASED SYSTEM WHICH IS IN THE PROCESS OF BEING TRANSFERRED TO AN OPERATING AGENCY FOR PRODUCTION USE, TRAINING, AND MAINTENANCE. HOWEVER, UNTIL THE PROCESS IS COMPLETED, CERL HAS BEEN AUTHORIZED TO WORK WITH DOD USERS IN EXTENDING THE FIELD TESTING OF THE SYSTEM. THIS ARRANGEMENT PROVIDES FOR CERL STAFF ASSISTANCE TO THE USER ON A COST REIMBURSABLE BASIS AND ON A STAFF AVAILABLE BASIS. THE DETAILS FOR MAKING SUCH AN ARRANGEMENT ARE DESCRIBED IN THE REPORT.

WHEN THE TRANSFER IS COMPLETED, THE OPERATING AGENCY WILL PROVIDE THESE SERVICES.

Louis J. Circeo
LOUIS J. CIRCEO
Colonel, Corps of Engineers
Commander and Director

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This report provides user instructions for the U.S. Army Construction Engineering Research Laboratory's (CERL's) Blast Noise Prediction computer program, BNOISE 1.0, which is designed to predict the noise impacts of Army blast-noise operations. This report is designed to serve as a reference manual and describes the manipulation of the modules used by the Blast Noise program, provides a sample run, and gives a list of module error messages.

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FOREWORD

This research was conducted for the Directorate of Military Programs, Office of the Chief of Engineers (OCE), under Project 4A762720A896, "Environmental Quality for Construction and Operation of Military Facilities"; Task 03, "Pollution Control Technology"; Work Unit 001, "Prediction and Reduction of Noise Impact." The QCR number is 3.01.007. Mr. F. P. Beck, DAEN-MCE-P, is the Technical Monitor.

The work was performed by the Environmental Division (EN), U.S. Army Construction Engineering Research Laboratory (CERL). Dr. R. K. Jain is Chief of EN.

COL J. E. Hays is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.

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THE BLAST NOISE PREDICTION PROGRAM:
USER REFERENCE MANUAL

1 INTRODUCTION

Background

The recognition of noise as a major environmental pollutant has required the Department of the Army (DA) to assess the noise impact of its operations on noise-sensitive land areas on or adjacent to its facilities. Since a major component of the noise produced by Army installations is impulsive noise, such as blasts resulting from artillery training, the U.S. Army Construction Engineering Research Laboratory (CERL) has developed a prediction methodology to determine the effects of these impulsive noise sources on military and civilian communities.[1,2] This methodology, when used with land-use maps, can identify impacts on present noise-sensitive land areas,* and can predict present and future incompatible land-use areas.

The Blast Noise Prediction computer program, BNOISE 1.0, was developed to augment this methodology by allowing faster computation of noise values (in terms of L_{Cdn}**). It also provides generalized and uniform noise-impact predictions when given a specific set of input data.[3,4] The output of the Blast Noise program is a set of L_{Cdn} contours which can be overlaid on a land-use map of a military facility and its environs and used to rapidly identify impact on noise-sensitive land areas. The type of land use identifies noise-sensitive areas, and the contours identify the impact area.

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1 P. D. Schomer, Predicting Community Response to Blast Noise, Technical Report E-17/ADA773690 (U.S. Army Construction Engineering Research Laboratory [CERL], December 1973).

2 P. D. Schomer, R. J. Goff, and L. M. Little, The Statistics of Amplitude and Spectrum of Blast Propagation in the Atmosphere, Vols I and II, Interim Report N-13/ADA033361 and ADA033475 (CERL, 1976).

3 Compilation of Operational Blast Noise Data, Draft Technical Report (CERL, 1979).

4 B. Homans, et al., Users Manual for Acquisition and Evaluation of Operational Blast Noise Data, Technical Report E-42/AD#782911 (CERL, 1974).

*The land use map identifies the "noise-sensitive" areas by identifying land uses.

**L_{Cdn} is the C-weighted, average day-night sound-exposure level used as the noise measurement criterion in TM 5-803-2, Environmental Protection: Planning in the Noise Environment (DA, 15 June 1978).

Objective

The overall objective of this study is to provide the methodology for predicting and reducing the noise impact of Army activities on noise-sensitive land areas on or adjacent to DA installations.

The objective of this report is to provide system documentation and user instructions for the Blast Noise computer program for predicting the noise impacts of Army blast-noise operations.

Outline of Report

Chapter 2 of this report presents (1) a system overview, (2) the USER'S RUN program, (3) the Blast Noise program module input and output, (4) methods of obtaining results from module output, and (5) module error messages. Chapter 3 provides a sample run of the Blast Noise program, including input and output samples. Chapter 4 describes a sample run of the Blast Noise program. The appendix outlines the procedures for bringing the Blast Noise program in and out of storage if it is not kept permanently active at the installation.

Scope

This report is written for persons who want to use the Blast Noise program, but do not need to know the details of the program itself. It can be used as a reference manual by those already familiar with running the program or as a training aid for those who are not. The Blast Noise program will be refined as new data become available, and/or as noise prediction methodology is changed and updated.

Mode of Technology Transfer

This manual is a basic document used to satisfy the requirements of system documentation and AR 18-1, Management Information Systems Policies, Objectives, Procedures and Responsibilities (DA, 22 March 1976).

2 PROGRAM DESCRIPTION

System Overview

Noise travels some distance from its point of origin (source) before dissipating. Therefore, to accurately evaluate the noise produced at a point, it is necessary to determine the level of sound produced in the area surrounding its source. The size of the area around a noise-producing source which must be evaluated depends on the initial energy of the noise; i.e., a low-energy noise will affect a smaller area than a high-energy noise.

The Blast Noise program evaluates the noise level of sound produced in an area around a noise source and uses the L_{Cdn} measure to quantify these noise levels in units of decibels (dB). The capability to quantify noise produced at a source is particularly valuable to Army planners who must evaluate and predict community response to the noise-producing activities of Army installations. To create L_{Cdn} values, the Blast Noise program uses a series of calculations which rely on a specific set of formulas and tables. These formulas incorporate raw noise-source data provided by the user; these data must be converted into a form suitable for computer input. Once the raw data have been compiled properly, they can be processed by the computer.

The formulas require several user-supplied specifications:

1. The number of rounds (blasts) occurring during the day and night. (Note: A penalty of 10 dB is currently applied to nighttime operations [2200 and 0700 hours]).

2. The locations of the firing point and the target point.

3. Weather information for the region being surveyed.

In addition, the user must specify the boundary coordinates for his* area of interest and tell the program what size blocks he wants the area to be broken into for computational purposes. The program uses this information to divide the user's area into a grid of points, a matrix of x and y coordinates. The program calculates the noise level for all sources at each of the grid points. The values are stored, and can be printed out at the user's discretion, listed by coordinates, to produce a reference table of the noise level at each given point. The user can also request a paper plot showing the noise-level contours in the area around the source(s) being evaluated. The program creates these contours by joining points having the same noise-level values.

*Male pronouns are used throughout this report to refer to both genders.

(However, the user must first tell the program which levels he wants plotted -- for example, every 5 dB between 55 to 75 dB. The user can also request an outline of the installation or other relevant region. This additional information can serve as a visual reference for the levels.) These contours are used to predict the noise impact of Army artillery, armor, and demolition activities.[5]

The Blast Noise program is written in Fortran IV and is used on a Control Data Corporation (CDC) 6600 computer. It consists of a main controlling program called LCDN, which invokes a series of subroutines when given a set of modules chosen by the user. The Blast Noise program can be stored permanently at an installation. One form of storage is magnetic tape.

USER'S RUN

When the user wants output from the Blast Noise program for a set of data, he must compile a deck of cards called the USER'S RUN. The USER'S RUN cards invoke the Blast Noise program, provide the data it requires, and cause it to run and perform its computations.

This deck is composed of:

1. Job Control Language (JCL) cards

2. Input data cards

3. Module cards.

Figure 1 presents the order of these sections within the deck. The user's main interest is providing the Blast Noise program with data that is in the proper form, knowing what the modules do, and understanding what type of output can be expected from them. After preparing his deck, the user must submit it to the computer operator, who has it read by the computer; the computer then uses the instructions on the cards to run the Blast Noise program.*

Information submitted to the computer through cards must appear in a specified form and position on the cards. FORMAT is the predetermined positioning and the appearance of data items typed on the card. The Blast Noise program uses three basic types of FORMAT; each FORMAT corresponds to data having particular characteristics.

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5 Compilation of Operational Blast Noise Data, Draft Technical Report (CERL, 1979).

* Questions concerning running the program at specific installations should be directed to local ADP personnel.

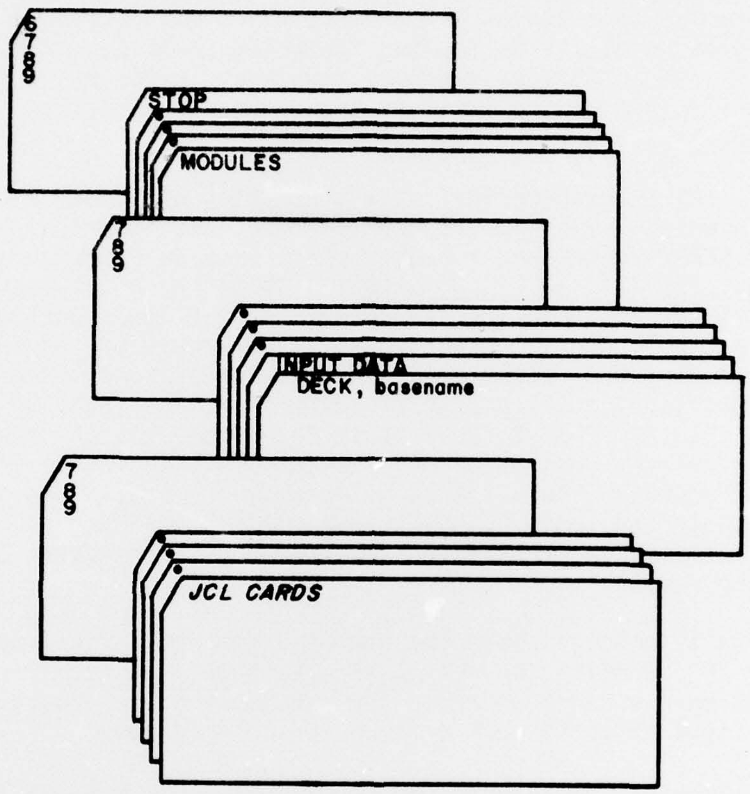

Figure 1. Composition of the USER'S RUN.

1. A -- alphanumeric data, i.e., items combining the letters A through Z and the numbers 0 through 9. Module names such as "PLOT" or firing point ID such as "FP1" are examples of alphanumeric data. "A10", for example, is a field of up to 10 characters (letters and numbers), with the first character entered in the left-most column of the 10 columns allowed for that field (i.e., left justification).

2. I -- integer number, i.e., a number which can be written without a decimal point, because it contains no fractional portion. "I7", for example, is a seven-column field which may contain a number that is up to seven digits in length, including the minus sign, if the number is negative. The lowest-order, right-most digit must appear in the right-most column of the field if the number is less than seven digits in length (i.e., right justification).

3. F -- all other numerical data consisting of normal decimal numbers, i.e., numbers having an integer and fractional portion. The "10" in a "F10.2" FORMAT describes a number which must be typed in a 10-column field. The "2" in "F10.2" specifies that the right-most two columns of the field are predefined as being the fractional portion of the number if a decimal point does not appear anywhere in the 10-column field. A decimal point appearing in the field overrides the predefined fractional specification; i.e., if the user typed "51322.6519" for the above format (F10.2), the computer would recognize that the number has four digits after the decimal point, not just two. However, if the user had typed "5132206519", then the computer would recognize the number as 51322065.19 under the above FORMAT specification. Leading and trailing blanks within a field are converted to zeroes by the computer before it works with the number.

Note: an alphabetic character cannot appear in a field specified as an "I" or "F" FORMAT. The user must make sure data items are in the proper format on the cards in order for the Blast Noise program to interpret the input correctly and produce the desired output.

Before the user can run his deck, he must take the Blast Noise program from permanent storage and make it active on the computer, or if Blast Noise is already stored on a computer file, he must identify and retrieve that file from the software system. The Appendix lists the commands for taking Blast Noise in and out of storage and for making it active. Retrieval commands must be input on cards; one command is typed per card, starting in the left-most column. The user must submit the appropriate retrieval-command deck to the computer <u>before</u> submitting the USER'S RUN deck.

JCL Cards

The user must provide a set of system-specific JCL cards at the beginning of the USER'S RUN deck. These cards inform the computer that someone wants to use the stored Blast Noise program. The JCL cards do

not change from run to run for the average user; therefore, he should not be concerned with them beyond knowing that they must precede the cards of the actual data items and module calls in his deck.

The normal JCL cards* for the Blast Noise program are shown below. They must be typed one line per card, with each line starting in the left-most column (i.e., column 1). Information which must be supplied by the user is underlined.

```
PWSuser's initials, CM160000,T1000,P2.
CHARGE,PUWS,account #,RS,I.
ATTACH(PROCFIL,NEFPROFIL,ID=PUWS)
ATTACH(TAPE20,TAPE20,ID=PUWS)
UPDATE,N,D,C=TAPE7.
BEGIN,NEFPROC.
BEGIN,PLOT.

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```

"User's initials" are two letters used by the computer as part of the label to identify individual runs. The "account #" must be obtained from the local ADP personnel.

The JCL section of the USER'S RUN is terminated by multipunching "7", "8", and "9" in the first column of an otherwise blank card.

Input Data Cards

The Blast Noise program considers noise from two types of sources: firing points and target points. The firing point is the spot from which a projectile is launched or the site of a demolition charge; the target point is the site of a projectile's impact. Note: If data are to be useful to the Blast Noise program, a projectile's launching weapon must produce a sharp blast and not a drawn-out, "whoosh-type" sound like that emitted by most rockets.

Among the data required on input cards are (1) the x and y coordinates on the firing range of both the target and firing points, and (2) the amount of propellant and projectile charge in TNT equivalents producing the noise at both the firing or target point. For sound occurring only at a firing point, the user must determine whether it is caused by an explosion at that point (e.g., a demolition charge), or whether it is a case of a weapon propelling a projectile which makes no noise upon impact at its target point (e.g., an illumination round). In the first case, only the firing point coordinate is needed; in the second case, both firing and target point coordinates are required, even

* This JCL is for a CDC computer system used by CERL.

though there is no sound at the target, because noise produced by a weapon has an associated directivity pattern that varies the amount of sound produced at the front and to each side of the weapon. The degree of variance depends greatly on the weapon's physical characteristics. A stationary blast, however, produces noise omnidirectionally from its source.[6]

It is the user's responsibility to differentiate between the amount of propelling charge at the firing point and the amount of projectile charge exploding at the target point. These values vary for different weapons and ammunition. Table 1 presents the codes used for a certain set of standard weapons. Table 2 lists the weights of propellant and projectile charges for these weapons in TNT equivalents. Table 2 shows that various sizes of propellant can be used to fire one size of projectile. The user is not restricted to the weapon data listed in Tables 1 and 2. He may create data to suit his needs as long as they are put into the proper format and labeled with a new gun type code.* ("New" means that the number differs from one of the codes already provided.) This prevents the computer and/or other users from confusing it with a code that has already been listed. At no time can two different weapons have the same code within one deck. The user must also specify the number of rounds fired by each weapon at each point during the day (0700 to 2200 hours) and during the night (2200 to 0700 hours). If the projectile does not explode on the ground, the height above or below ground of the explosion must be specified.

The input data card portion of the USER's RUN deck is divided into:

1. Gun type cards

2. Target-point definition cards

3. Firing-point definition cards.

The gun type cards list the charge information for the weapons. (Table 3 outlines the required format.) The target-point definition cards list the x and y coordinates of the target area. In addition to listing the x and y coordinates of the firing point, the firing-point definition cards specify (1) what types of weapons are the noise-producing sources (chosen from the gun type cards), (2) how often each specified weapon is fired, (3) whether the projectile impacts at the target, and (4) the height of impact. Table 4 presents the card format for the firing- and target-point data. Figure 2 shows the sequence in which the

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[6] P. D. Schomer, L. M. Little, and A. B. Hunt, Acoustic Directivity Patterns for Army Weapons, Interim Report N-60/ADA066223 (CERL, October 1978).

* The procedures for collection and coding of these data are given in draft Technical Report, Compilation of Operational Blast Noise Data (CERL, 1979).

Table 1

Weapon Codes

Weapon	Code
105-mm howitzer (M102)	1
155-mm howitzer (M109)	2
8-in. howitzer (M110)	3
175-mm gun	4
155-mm howitzer (M109A1)	5
155-mm howitzer (M114)	6
8-in. howitzer (M110A1)	7
Small-charge TNT (0.25 to 90 lb)	10
Large-charge TNT (110 to 500 lb)	11
60-mm mortar	20
66-mm mortar	21
81-mm mortar	22
4.2-in. (107-mm) mortar	23
57-mm recoilless rifle	30
90-mm recoilless rifle (M67)	31
106-mm recoilless rifle (M40)	32

Weapon	Code
20-mm gun	40
40-mm gun	41
57-mm gun	42
90-mm gun	43
105-mm gun	44
152-mm gun (Sheridan)	45
2.75-in. rocket	50
3.5-in. rocket	51
66-mm rocket	52
LAW missile	53
TOW missile	54
Draggon missile	55
Shillealagh missile (from 152-mm gun)	56
40-mm grenade launcher	60
M79 rifle grenade	61
M67 hand grenade	62
M60 tank (105 mm)	90
M68 tank (105-mm tank gun)	91
M135 165-mm cannon	93

Table 2

Projectile and Propellant Weights for Table 1 Weapon Codes
(TNT Equivalent in Pounds)

Weapon Code	Projectile Weight	Propellant Weight — Charge Zones 1	2	3	4	5	6	7	8	9	10
1	4.6	.5175	.605	.7731	1.004	1.3275	1.8656	2.7456			
2	15.4	1.7687	2.2875	3.0875	4.025	7.05	9.8375	13.275	20.34		
3	36.3	5.3188	6.2688	7.5125	9.5188	16.85	22.0125	28.1375			
4	31.3	23.56	39.7	57.24							
5											
6											
7											
10		.25	1.	5.	10.	15.	25.	35.	50.	70.	90.
11		110.	140.	170.	200.	240.	290.	340.	380.	440.	500.
20	.66	.19	.22	.24	.27	.3	.42				
21	.6	.22	.25	.28	.31						
22	2.25	.042	.0653	.0886	.1119	1.352	.1585	.1818	.1941	.2284	
23	8.5	.0803	.1132	.1642	.3369	.6717					
30	.5	1.0									
31	1.72	1.23									
32	2.75	7.62									
40	.05	.2									
41	.12	.718									
42	.44	2.41									
43	2.15	7.3									
44	4.6	.5175	.605	.7731	1.004	1.3275	1.8656	2.7456			
45	9.5	6.0									
50	5.0	.01									
51	1.88	.01									
52	.13	.85									
53	.66	.01									
54	5.3	.01									
55	3.5	.01									
56	8.0	14.									
60	.6	.01									
61	.6	.0001									
62											
90	2.14	11.5									
91	6.6	5.9									
93	20.	2.12									

Table 3

Input Data Format Description -- Gun Type Cards

Card ID	Columns	Format	Description	Comments/Defaults
GUN	1	A 1	"*" if last gun type card	See Tables 1 and 2
	2-3	I 2	Weapon code	2-digit number giving the code for a specific weapon name
	4-10	F7.0	Projectile weight	In TNT equivalents
	11-17	F7.0	Propellant weight	In TNT equivalents
	18-24 25-31 32-38 39-45 46-52 53-59 60-66 67-73 74-80			10 charge zones allowed (values as specified in Table 2)

Table 4

Input Data Format Description -- Target-Point and Firing-Point Definition Cards

Card ID	Columns	Format	Description	Comments/Defaults
One TRG-1 Card Per Target Point Up to a Max of 50 Targets				
TRG-1	1	A 1	"*" if last target card	
	3-5	A 3	1- to 3-character target ID	
	7-12	F6.0	Location, x-coordinate	
	13-18	F6.0	Location, y-coordinate	
	19-24	F6.0	Ground correction factors (dBs)	4.0 dB
One FP-1 Card and Associated FP-2 Cards per Firing PT				
FP-1	3-5	A 3	Firing point ID	
	7-12	F6.0	Location, x-coordinate	
	13-18	F6.0	Location, y-coordinate	
	19-24	F6.0	Ground correction factor	
FP-2	1	A 1	"*" if last definition card for a particular firing point	
	19-20	A 2	Gun type (code)	See Tables 3 and 4
	21-24	F4.0	No. of day firings	0.0
	25-28	F4.0	No. of night firings	0.0
	29-30	I2	Min. charge zone	See Tables 3 and 4
	31-32	I2	Max. charge zone	
	33-35	A3	Corresponding target ID	Must be blank if firing point sound is omnidirectional (i.e., demolition or explosives).
	36	I1	"1" = No noise at target	If target ID is blank, this must be set to "1"
	37-41	F5.0	Height, in feet, if applicable	"-" below ground "+" above ground

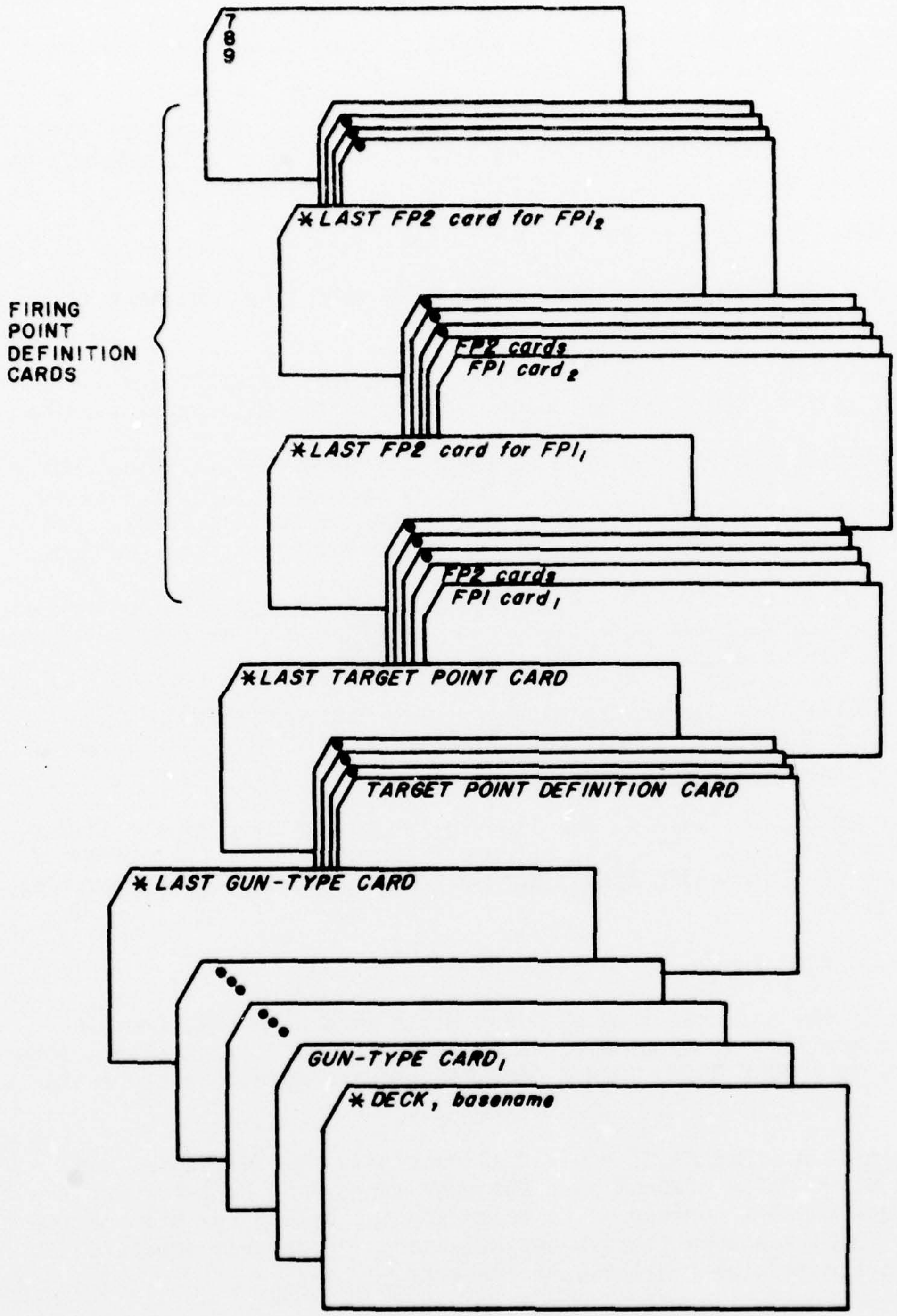

Figure 2. Composition of input data.

input data cards are arranged within the deck for input to the Blast Noise program.

Tables 3 and 4 and Tables 5 through 13, which summarize card input, have the following column headings:

CARD ID: Gives each card of a module a name as a reference label; e.g., the first card in MAP is called MAP-1. This label is used only in reference to a card; it does not appear as an item on the card.

COLUMNS: The card columns in which data item must appear.

FORMAT: FORTRAN description of how that data item must look (A, I, or F), as previously described.

DESCRIPTION: Tells what parameter is being referred to and includes any special codes and/or notes about required data and its units.

COMMENTS/DEFAULTS: The default value is the number the Blast Noise program will use if an item is left blank by the user. If there is no default value listed for it, that data item cannot be left blank. Special instructions regarding that card are included under this heading.

PREVIOUS CALLS REQUIRED: Lists modules whose output is required as input to the module being considered and therefore must be called before that module can be used.

> NOTE: Any characters between the quote marks (" ") are the actual items written in the specified columns of that module card.

For example, in Table 4, the item in the second card of the firing-point definition cards (FP-2) in columns 21 through 24 is one number of firings per day (0700-2300 hours) with a FORMAT F4.0, and has a default value of zero.

Additional Module Input

Most of the data required by Blast Noise modules are self-explanatory and are listed, by module, in Tables 5 through 13. However, some parameters in PUDDLE GRID, FORM-A, and MAP require more detailed explanations.

Modules. A sequence of individual sections, called modules, informs the Blast Noise program what the user wants done to the input data. These modules correspond to major subroutines in the Blast Noise program. There are more subroutines necessary for program operation than there are modules available to the user.

Table 5

BASE Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
BASE-1	1-4	A10	"BASE"	
BASE-2 CARD REPEATED AS NECESSARY TO DESCRIBE BASE OUTLINE				
BASE-2	1-10	F10.0	Coordinates of point in set Describing one line segment	
	11-20	F10.0		
	21	A 1	"*" end of line segment; following pt. starts new line	
BASE-3	21	A 1	"*" indicates end of data for "BASE"	

NOTE: Must have at least one BASE-3 card. It will have a "*" in column 21.

PREVIOUS CALLS REQUIRED: NONE

Table 6

BOUNDS Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
.....	CALLS TO OTHER MODULES		.....	
BDS-1	1-6	A10	"BOUNDS"	
BDS-2	1-10 11-20	F10.0 F10.0	Minimum X coordinate Minimum Y coordinate	Boundary values used by PUDDLE GRID, PLOT, SCATTER and LOCATOR must be set before calls to above routine
BDS-3	1-10 11-20	F10.0 F10.0	Maximum X coordinate Maximum Y coordinate	

PREVIOUS CALLS REQUIRED: NONE

Table 7

FORM-A Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
.....	PREVIOUS CALLS TO OTHER MODULES, IF ANY		.....	
FRMA-1	1-6	A10	"FORM-A"	
FRMA-2	1-4	A10	Charge avg'g technique "MAX" "IAVE" "CAVE"	"MAX" -- use max charge zone "IAVE" -- use average of charge zones "CAVE" -- use average of actual TNT equivalent
	11-20	F10.0	Ground correction	Default = 4 dB
FRMA-3	1-10	F10.0	No. days of information in data base	Default = 1 day

PREVIOUS CALLS REQUIRED: NONE

Table 8

LOCATOR Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
......	CALLS TO OTHER MODULES, IF ANY			
LOC-1	1-7	A10	"LOCATOR"	
LOC-2	1-10	A10	"ALL", "TARGET", or "FIRING"	
	11-20	A10	"NAME" - prints ID on plot	
	21-30	A10	"LOCATION" - prints coordinates	
	21-40	F10.0	Size of letters	Default = .14; best results are obtained if multiple of 7 and .005
	41-50	F10.0	Rotation of letters	Default = 0°

PREVIOUS CALLS REQUIRED: "BOUNDS"

Table 9

MAP Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
MAP-1	1-3	A10	"MAP"	
MAP-2	1	I1	Print data base info. if ≠ 0	
	2	I1	Print target x firing pt. ref. table if ≠ 0	
	3	I1	Print gun type x target ref. table if ≠ 0	
	4	I1	Print gun type x target ref. table if ≠ 0	
	5	I1	Print gun type x firing pt. ref. table if ≠ 0	
	6	I1	Don't print "Extraneous Data" message if ≠ 0	
MAP-3	1-10	F10.0	No. days of info. in data base	
MAP-4	1-2	I2	No. grid sizes to be tested	
MAP-5	CARD SHOULD BE REPEATED N TIMES AS SPECIFIED BY MAP-4			
MAP-5	1-10	F10.0	Grid size "METERS"/"FEET"/Grid Unit	

PREVIOUS CALLS REQUIRED: NONE

Table 10

PLOT Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults (Range
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
......	CALLS TO OTHER MODULES		......	
PLT-1	1-4	A10	"PLOT"	
PLT-2	1	I1	"1" if PUDDLE GRID output (Tape 7) to be used	"0" otherwise
	2	I1	"1 if LOCATOR output (Tape 3) to be used	"0" otherwise
	3	I1	"1" if SCATTER output (Tape 4) to be used	"0" otherwise
	4	I1	"1" if BASE output (Tape 2)	"0" otherwise
PLT-3	1-7	F7.0	Scale	50000.(1000 $< x <$ 99999)
	8-11	F4.0	%X	1.0(.01 $\leq x \leq$ 9.0)
	12-15	F4.0	%Y	1.0(.01 $\leq x \leq$ 9.0)
	16-19	F4.0	Magnification	1.0(.01 $\leq x \leq$9.0)
	20-23	F4.0	% smoothing	.333(.01 $\leq x \leq$ 9.0)
	24-26	I3	1st contour level to be plotted	55(1 $\leq x \leq$ 999)

Table 10 (Cont'd)

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults (Range)
PLT-3	27-29	I3	Last contour level to be plotted	(75)($1 \leq x \leq 999$)
	30-32	I3	1st contour level to be labeled	(55)($1 \leq x \leq 999$)
	33-35	I3	Last contour level to be labeled	(75)($1 \leq x \leq 999$)
	36-37	I2	Label	1 (1 = Labels, -1 = No Labels)
	38-39	I2	Contour increment	5 ($0 \leq x \leq 99$)
	40-41	I2	Label increment	5 ($0 \leq x \leq 99$)
REPEAT PLT-4 & PLT-5 CARDS AS MUCH AS NEEDED				
PLT-4	1-10	F10.0	X coordinate - starting loc. of label	
	11-20	F10.0	Y coordinate - starting loc. of label	
	21-30	F10.0	Height	
	31-40	F10.0	Angle	
	41	I1	0 = plotter coordinates (in.) I = map coordinates	Default = 0
	42-79	38A1	Text (terminated by $)	
	80	A1	"*" indicates last text card	

Table 10 (Cont'd)

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults (Range)
PLT-5	1-10	F10.0	Height (if different from preceding)	Additional text
	11-79	69A1	Text continued (terminated by $)	For labeling
	80	A1	"*" if last card	
PLT-6	80	A1	"*" if last card, follows PLT-3 if PLT-4 & PLT-5 are not included	

PREVIOUS CALLS REQUIRED: a) "BOUNDS", "PUDDLE GRID"
b) "BASE", "LOCATOR", "SCATTER" if they are used at all

Table 11

PUDDLE GRID Module -- Input Summary

Card Input

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
......	CALLS TO OTHER MODULES			
PGRD-1	1-11	A10	"PUDDLE GRID"	
PGRD-2	1-10 11-20 21-30	F10.0 F10.0 F10.0	INVERSION FACTORS	SURFACE 100-500 ft (30-152 m) 500-3000 ft (152-914 m)
	31-40	F10.0	Grid size in meters or feet	
	41-50	A10	"DAY", day noise only "NIGHT", night only "BOTH", both	

PREVIOUS CALLS REQUIRED: "BOUNDS", "FORM-A"

Table 12

SCATTER Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
......		CALLS TO OTHER MODULES		
SCT-1	1-7	A10	"SCATTER"	
SCT-2	1-4	4A1	Combination in any order of the letters: T - SCATTER info. collected for targets F - SCATTER info. collected for firing pts. B,D,N - Both day and night data, day only, night only, respectively G - Only specified gun types (From columns 5-60)	DEFAULT = TFB
	5-6	A2	If "G" selected, these are the specified gun types	
	7-8	A2		There should be no blanks interspersed among ID's as scanning stops at first blank encountered.
	9-10	A2		
	.			
	.			
	.			
	59-60	A2		

Table 12 (Cont'd)

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
	61-70	F10.0	Multiplier - SCATTER pts. will be multiplied by the factor before dividing by days	Default = 1
	71-80	F10.0	Standard deviation (Meters/Feet)	(300) NO DEFAULT
SCT-3	1-10	F10.0	No. of days in data base	Default = 1

PREVIOUS CALLS REQUIRED: "BOUNDS"

NOTE: By sorting the data by location, *more efficient plotting may be* obtained.

Table 13

STOP Module -- Input Summary

Card Input:

Card ID	Columns	Format	Description	Comments/Defaults
NEF-1	1-6	A10	Distance units "METERS"/"FEET"	
....				
STP-1	1-4	A10	"STOP"	Closes NASAPLOT input file

PREVIOUS CALLS REQUIRED: ALL MODULES FOR GIVEN USER'S RUN

To identify and run a Blast Noise program module, the user must input (1) a card identifying the module being run, followed by (2) a card (or cards) specifying the parameters which that module requires to function correctly. The user varies the parameters to account for the input data and to produce desired output. Output can be either a set of printed tables of L_{Cdn} values or an actual paper plot of L_{Cdn} contours, depending on which modules are invoked. There is some freedom in the ordering of the modules; however, certain modules use the output generated by other Blast Noise modules as input. If the user chooses one of these "dependent" modules, he must be careful that it is put in proper order in relation to the modules which will provide the data it needs to generate output. Figure 3 is a flowchart for Blast Noise modules which shows the input they require and the output they produce. When a module is invoked, the computer will print the results in a report and internally save some results for use by other modules. The modules currently available from the Blast Noise program are:

NEF-1: Specifies whether the data base coordinates are in "METERS" or "FEET". There is only one of these cards in each USER'S RUN, and it is always the first card in the module section.

BASE: Generates line segments which can be drawn by the PLOT routine on the paper plot output. It can be used to create an outline of the facility for which the user is providing data. It can also be used to draw two intersecting lines on the PLOT output to line the drawing up with map grid lines. It causes PLOT to draw line segments from coordinate to coordinate, as specified.

BOUNDS: Uses map coordinates to set the limits of the total area encompassed by L_{Cdn} calculations and the area to be enclosed by the PLOT drawing. Used to define the area in which the user is interested.

FORM-A: Tabulates target- and firing-point information from the input data. Compresses data into the form required by PUDDLE GRID.

LOCATOR: Labels target and firing points on the plot.

MAP: Does elementary error checking and is a preprocessor for the input data. Also produces a listing of input data and generates cross-reference tables.

PLOT: Combines output from appropriate modules for use by the NASAPLOT* program to create actual paper contours of L_{Cdn} levels.

PUDDLE GRID: Creates a rectangular grid of L_{Cdn} values. Area is specified by the user.

* Source: E. Gillian, National Aeronautics and Space Administration (NASA), Langley Research Center, Hampton, VA.

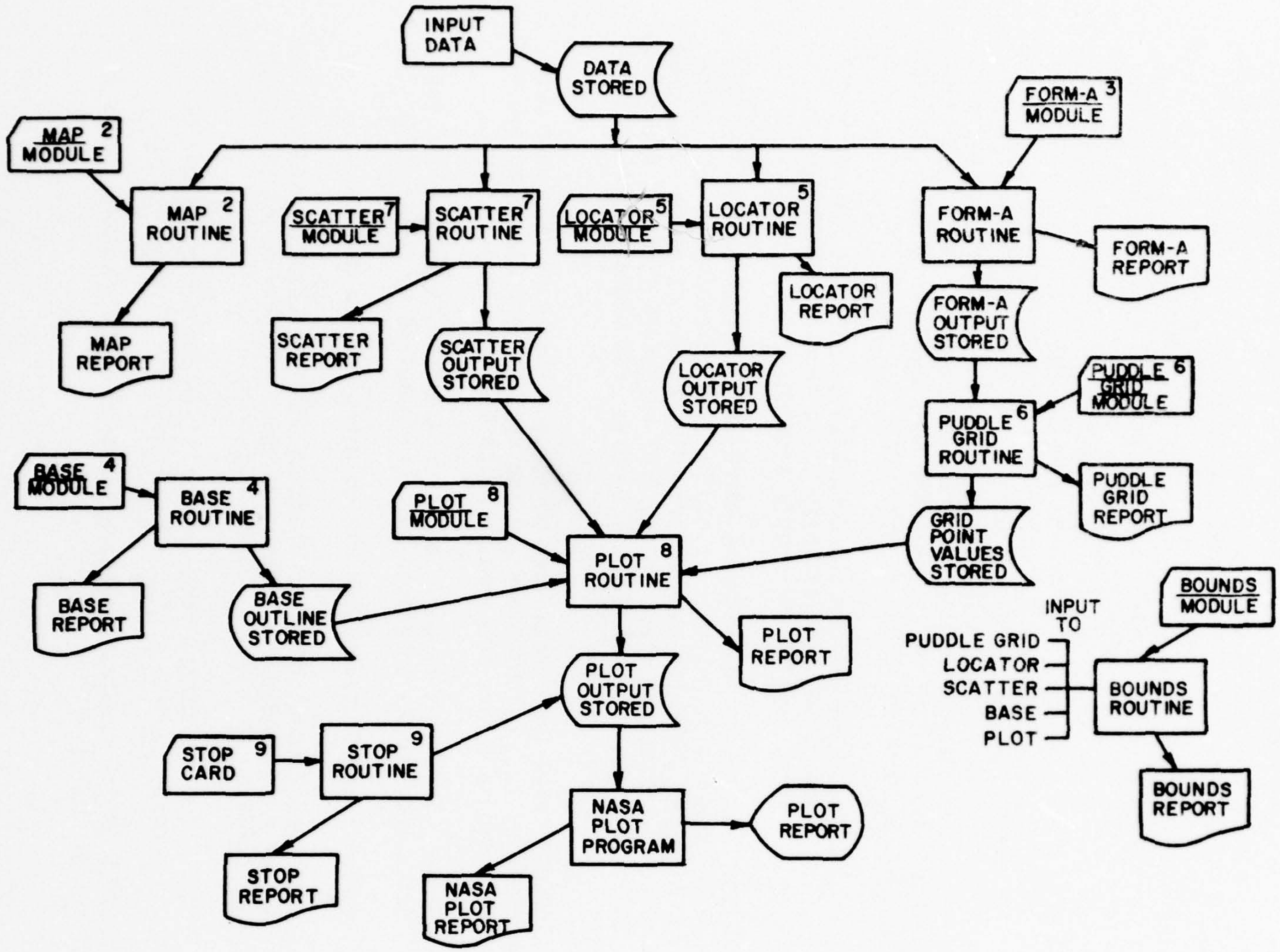

Figure 3. Flowchart for USER'S RUN program modules.

SCATTER: Allows the PLOT routine to create a scattergram (dots) of noise sources; the number of dots is proportional to the blasting activity at each firing and target point.

STOP: Signals to the Blast Noise program that the module section of the USER'S RUN deck has been terminated.

A multipunch 6789 card must be the last card in the USER'S RUN; the multipunch informs the computer that all input for the USER'S RUN has been submitted and that the system does not need to look for more cards to execute the run.

Figure 4 represents a possible sequence in which the modules of the Blast Noise program could be ordered by the user in the USER'S RUN. Tables 5 through 13 summarize the input required by each module of the Blast Noise program. These tables describe the instruction cards for the modules and list the specifications for all the parameters required by each module.

PUDDLE GRID

Grid Size

The "grid size" specification (Table 11, card PGRD-2, Columns 31-40) in the PUDDLE GRID module specifies how often, in terms of x and y coordinates, the L_{Cdn} values are to be computed; e.g., every 1000 m or 2000 ft are reasonable values if the overall land area included in the contour is fairly large. The smaller the values used, the finer the grid size, and the smoother the contour produced, because the program has a greater number of actual points to plot from and fewer to approximate. In other words, the plotting routine can do a better job when it has more information to work from. Cutting the grid size in half will cause four times as many points to be computed, but will cost about four times as much to run, since run cost is proportional to the number of points computed. The user must consider that when the program computes a greater number of values, it will run longer, and therefore will cost more.

Inversion Factor

The "inversion factors" specification (Table 11, card PGRD-2, columns 1-10, 11-20, 21-30) in the PUDDLE GRID module provides a set of meteorological data to the program. Weather conditions, especially temperature, affect how sound propagates through the atmosphere. Currently, the Blast Noise program does not consider the effects of wind, but does account for temperature inversions. Therefore, the user must provide appropriate inversion data for the location of his noise study. Table 14 lists inversion factors for selected U.S. cities. The user should first find the city that is closest to the area from which his

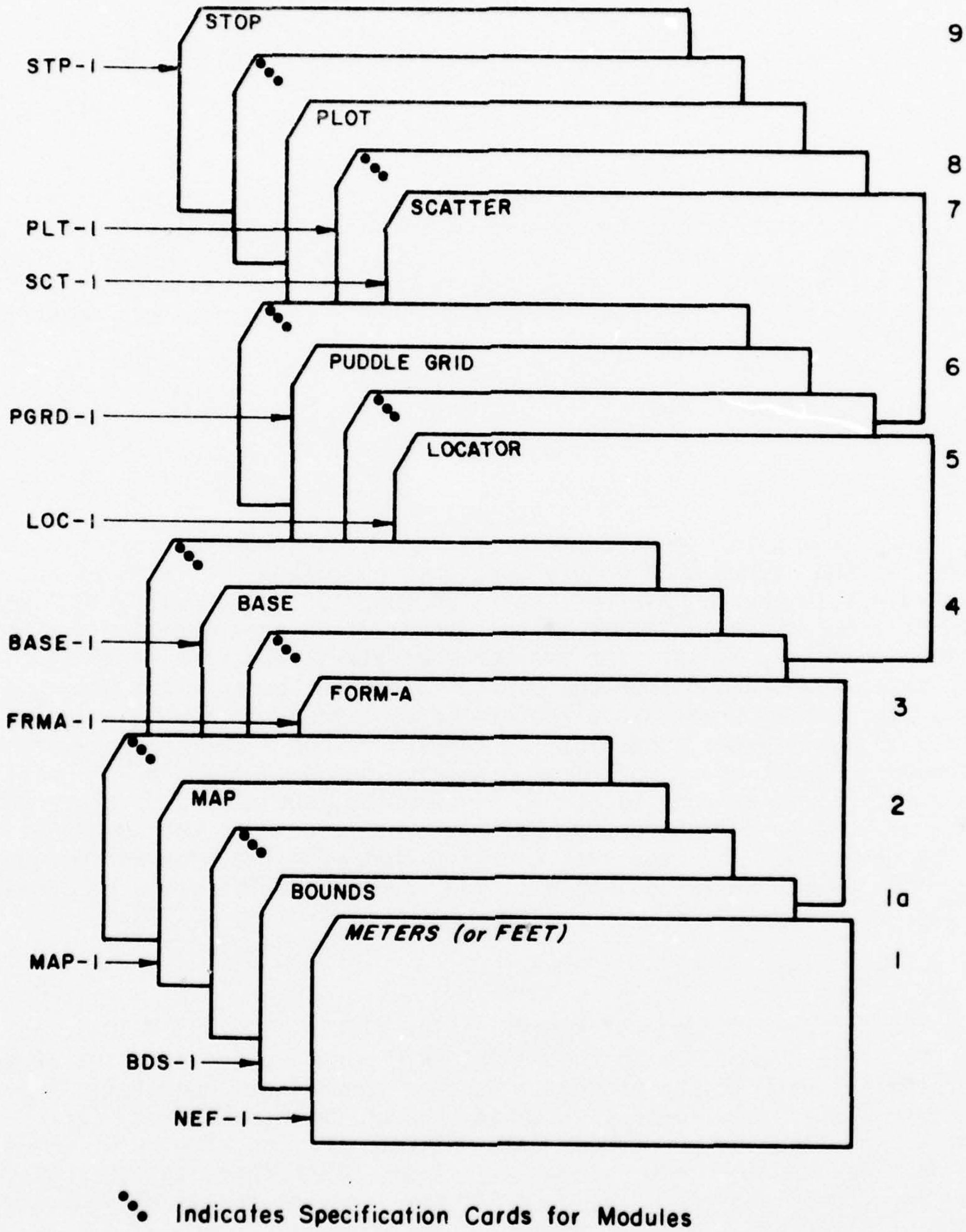

Figure 4. Sample composition of module section for USER'S RUN.

Table 14

Inversion Factors
for Selected U.S. Cities
(Inversion Study
Percentage Frequency of Temperature
Year: All Seasons Combined;
Time: 12 GMT)

Location	Surface	1-500 m	1-3000 m
Albany, NY	45.1	20.1	45.0
Albuquerque, NM	71.9	6.0	11.4
Amarillo, TX	73.2	14.2	21.9
Anchorage, AK	55.2	13.3	25.1
Annette, AK	30.9	3.0	26.2
Athens, GA	70.1	13.0	23.5
Barter Island, AK	48.1	34.4	48.7
Bismarck, ND	64.3	18.0	32.0
Boise, ID	79.7	4.5	8.5
Brownsville, TX	61.0	9.5	30.4
Buffalo, NY	44.9	10.5	39.4
Burwood, LA	17.1	5.6	28.9
Cape Hatheras, NC	44.7	9.8	36.6
Caribou, ME	44.2	20.6	45.6
Charleston, SC	69.7	14.2	23.0
Columbus, MO	65.2	14.5	29.2
Dayton, OH	60.7	11.6	29.6
Denver, CO	82.8	4.3	12.3
Dodge City, KS	72.6	15.4	24.1
El Paso, TX	65.6	4.7	14.1
Ely, NV	91.6	.6	2.8
Fairbanks, AK	71.5	6.8	17.6
Flint, MI	53.2	15.2	36.5
Fort Worth, TX	45.8	25.0	48.0
Glasgow, MT	73.9	10.9	20.1
Grand Junction, CO	84.0	1.3	3.7
Great Falls, WI	79.6	4.3	11.5
Green Bay, WI	59.0	13.7	33.6
Greensboro, NC	65.9	12.4	25.1
Hilo, HI	85.1	.3	8.1
Huntington, WV	60.0	7.3	30.6
International Falls, MN	59.6	14.4	33.7
Jackson, MS	64.2	15.8	29.8
Jacksonville, FL	63.7	11.2	22.8
Lake Charles, LA	79.2	9.1	18.5
Lander, WY	84.6	1.2	6.1
Las Vegas, NV	84.2	1.1	5.8
Lihue, HI	24.0	.1	62.6

Table 14 (Cont'd)

Location	Surface	1-500 m	1-3000 m
Little Rock, AR	64.0	13.4	29.8
Medford, OR	76.7	5.1	13.9
Miami, FL	60.6	6.7	24.3
Midland, TX	65.8	15.5	27.9
Montgomery, AL	66.5	12.1	27.0
Nantucket, MA	46.6	18.3	46.5
Nashville, TN	66.0	10.5	27.8
New York, NY	27.8	22.0	56.8
Nome, AK	65.7	8.4	26.2
North Platte, NE	65.7	16.5	29.9
Oakland, CA	43.4	21.3	49.0
Oklahoma City, OK	63.4	17.0	30.9
Omaha, NB	64.1	19.6	32.6
Peoria, IL	68.2	14.4	27.6
Pittsburgh, PA	58.2	10.5	32.9
Point Barrow, AK	46.7	34.3	49.9
Portland, ME	55.0	17.6	36.6
Rapid City, SD	74.8	7.7	19.3
St. Cloud, MN	55.3	21.4	39.9
Salem, OR	63.6	7.3	22.3
Salt Lake City, UT	83.4	3.7	6.4
San Antonio, TX	34.6	14.0	51.1
San Diego, CA	47.3	26.8	50.0
San Juan, PR	44.7	1.3	24.5
Santa Monica, CA	42.2	26.6	53.0
Sault Sainte Marie, MI	53.9	15.4	36.5
Seattle, WA	52.2	5.2	25.0
Shreveport, LA	55.9	17.5	36.0
Spokane, WA	70.0	14.1	19.0
Tampa, FL	67.7	7.6	18.0
Tatoosh Island, WA	23.1	12.1	43.7
Topeka, KS	53.5	23.6	40.9
Tucson, AR	89.6	1.4	4.0
Wallops Island, VA	57.9	13.8	34.2
Washington, DC	67.0	7.7	26.9
Winnemicca, NV	88.3	1.5	3.7
Winslow, AR	88.0	2.1	4.9
Yukatat, AK	57.1	2.1	14.8

operational data originated. (Closest means nearest in both geographical and meteorological terms.) Then, having found the appropriate location, the user takes the value from the column labeled "SURFACE" and types the number in columns 1-10 of card PGRD-2. The values from the columns labeled "0-500 m" and "0-3000 m" are typed in columns 11-20 and 21-30, respectively.

FORM-A. The "charge averaging technique" specification (Table 7, card FRMA-2, columns 1-4) in the FORM-A module allows the user to choose how the program uses the charge zones specified for a specific weapon's propelling charges in the firing-point definition cards. For example, if the user states that weapon 1 normally uses charge zones 1 through 5, the options yield the following results:

1. If "MAX" is chosen, the program will use the charge zone specified in columns 31-32 of card FP-2, Table 4. The weight used by the computer is the one found in that charge zone on the gun type card for the specified weapon. In the example, the weight for zone 5 of weapon 1 would be used.

2. If "CAVE" is chosen, the program will average the weights obtained from the gun type cards for the minimum charge zone (Table 4, FP-2, columns 29-30) and the maximum charge zone (Table 4, FP-2, columns 31-32) of the specified weapon. In the example, if the weight for charge zone 1 was 10 lb (4 kg) and the weight for charge zone 5 was 20 lb (8 kg), then the weight used would be 15 lb (6 kg).

3. If "IAVE" is chosen, the program will average the minimum charge zone number (Table 4, FP-2, columns 29-30) and the maximum charge zone number (Table 4, FP-2, columns 31-32), rounding off fractions, and use the weight from the gun type cards for the computed zone; i.e., zones 1 and 5 will yield zone 3, and zones 1 and 4 will also yield zone 3.

If the upper and lower boundaries of the field are the same number, then all three options will arrive at the same charge size. For example, if 3 and 3 are specified on the firing-point definition card as the charge range, then the program will use whatever charge value is in field 3 of the propelling charges for that weapon, no matter which averaging technique is chosen.

MAP. If a user wants to determine how many points PUDDLE GRID will generate for a specific grid size, he requests this information from the MAP module instead of calculating it himself. The user must specify the number of various grid sizes he wishes to try on the MAP-4 card, and then list these with as many MAP-5 cards as necessary. The output from MAP will list the number of points that will be generated by the chosen grid sizes. The MAP module can be used to indicate the cost of producing a grid (see PUDDLE GRID section). These MAP module cards must be included even if the user does not want to use this feature. The values

commonly used are 01 for MAP-4 and 250 for MAP-5. For example, if the area of interest is 10000 by 10000 m, a grid size of 1000 m would produce 10 times 10, or 100 grid points.

Module Output

All Blast Noise program modules produce printed reports which are tables of intermediate or final results and, if necessary, error messages. (Some site-dependent information is printed before and after these printed reports, but this is usually of no concern to the user.) In addition, some of the information produced by particular modules is stored temporarily, to be used as input to other modules later in the program. These printouts provide a hard-copy record of information supplied to the Blast Noise program via module cards, and facilitate verification of the accuracy of module facts and data items input to the main program.

Obtaining Results From Module Output

The PUDDLE GRID and PLOT modules produce the module outputs that are of primary interest to the user. The paper contour produced by PLOT is often the result sought by the person creating a USER'S RUN. Because the user can control the amount of area enclosed by the plot, he can specify the plot's scale to obtain agreement with the maps he is working with, or he can scale down the plot to obtain a smaller version of his results for future or intermediate reference.

PUDDLE GRID output can also be a source of intermediate results. If the user does not want to incur the cost of an actual plot, he can still approximate the noise levels in any given area by using the table of $L_{C_{dn}}$ values produced by PUDDLE GRID. These tables can then be checked against the expected $L_{C_{dn}}$ levels in a given area. For example, if PUDDLE GRID output indicates that the region around a firing point has the lowest values of the entire table, the user should go back and recheck his data for errors. The table lists the $L_{C_{dn}}$ values by coordinates in increments specified by the GRID SIZE.

If the user wants only the PUDDLE GRID values and not the actual plot, he must modify the JCL section of his USER'S RUN by excluding the "BEGIN, PLOT." card from the deck. (And, of course, the PLOT module is omitted.)

Most modules also produce statistics giving the amount of system time spent by the computer in a given module. The user can approximate run cost with this information by multiplying system time by cost per time unit. For example, if a module ran for 300 milliseconds and the cost is one-third of a cent per millisecond of run time, then that module's cost is approximately $1.00.

Module Error Messages

Because the Blast Noise program does not know whether the data it transforms are correct, it will execute on incorrect data in the proper format if they are reasonable (e.g., no negative charge sizes). The program can only indicate errors in format and point out unreasonable data items; if there are enough errors and/or unreasonable items, the program will halt execution. Therefore, it is important that the user check the statistics produced by the modules to insure that the Blast Noise program is performing operations on the correct data.

Error messages tell the user that there is something wrong with the data he has provided to the Blast Noise program. Warning messages indicate that there is something extraordinary, but not necessarily wrong, about the data. For example, a charge size that is appreciably larger than other charge sizes input by the user would trigger a warning message, alerting the user to the probability of a misplaced decimal point.

The error/warning messages produced by each module are listed in the following sections.

Base Module

"***NEXT CARD NOT WITHIN BOUNDARIES***" -- An x or y coordinate of a line segment instruction in BASE extends beyond the minimum or maximum values specified in BOUNDS.

"ERROR...NO EOF CARD (* IN CC21)
JOB ABORTED"

The user forgot to include a BASE-3 card with a "*" in column 21 to indicate that the input for the BASE module has been completed.

"***DUE TO BOUNDARY ERRORS NO OUTPUT***
TAPE WAS CREATED THIS RUN"

If either of the above two errors has occurred, the BASE module will have no output that can be used by the rest of the program.

BOUNDS Module

"*INCORRECT BOUNDARIES*
NO BOUNDS SET"

There has been a mistake in specifying the boundaries; the maximum values are less than the minimum ones.

"*ERROR -- MISSING INPUT CARD; JOB ABORTED*"

A BOUNDS card is missing; the module has not been given all of its data.

Form-A Module

"......WARNING GUN IS POINTING AT SELF
...LOCATION x"

The firing and target points have been defined to be the same spot at the specified location.

"......ERROR......ALL SOURCES ARE TARGETS
NUMBER OF SOURCES COUNTED ARE:x"

No firing points have been specified. Note: The user can have all firing points if all rounds are demolitions without targets, but not vice versa. If there is no target point card, a "*" is still required to indicate the end of the target data.

"......ERROR......NUMBER OF SOURCES WILL EXCEED SPACE
NUMBER OF SOURCES NOW IS___"

Too many data have been provided. Current limit is ___.

"......ERROR......UNDEFINED TARGET ID FOR FIRING PT ___"

A firing point is shown to have a target-point which has not been defined in the target-point definition cards. This is often the result of a spelling error.

"......ERROR......UNDEFINED GUN ID, FOR FIRING PT ___"

A firing point is shown to have a gun code which has not been defined in the gun type cards. This may be the result of a spelling error.

"......ERROR......EOF ENCOUNTERED WHILE PROCESSING GUN TYPE TABLE
DATA"

A "789", which indicates the end of input, has been found in the middle of the gun type cards.

"......ERROR......GUN TYPES EXCEED TABLE LIMIT"

Too much data has been given. The current limit is 25 gun types.

"......ERROR......BLANK TARGET ID, OMNI/KILL FLAG NOT SET FOR SOURCE AT
FIRING POINT___"

The "demolition" flag for a firing point has not been set, and no target has been specified for it. One or the other must be specified.

LOCATOR Module

"*PREMATURE EOF ON DATA BASE FILE*
TAPE3 NOT CREATED"

A "789" has been encountered in the wrong place.

MAP Module

"ERROR -- EOF ENCOUNTERED WHILE READING TARGET CARDS"

A "789", indicating the end of input data, has been found in the middle of the target-point definition cards.

"ERROR -- SOURCE DEFINITION CARDS ENDS IMPROPERLY (WITH A EOF)..."

A "789" instead of a star ("*") was encountered at the end of a set of definition cards to indicate the last of the cards.

"ERROR -- UNDEFINED TARGET ID"

A target-point name was entered on a firing-point card, but no defining data were included in the target cards.

"ERROR -- GUN TYPES EXCEED TABLE LIMIT IN MAP; ONLY FIRST ___ TYPES USED FOR SUBSEQUENT CHECKING"

There is not enough space to do all cross-reference checking; there are too many gun type cards.

"ERROR -- UNDEFINED GUN ID"

A gun code was entered on a firing-point card, but there were no defining data among the gun type cards.

"ERROR -- BLANK TARGET ID, HIT FLAG NOT SET: FIRING PT ___"

The "demolition" flag for a firing point has not been set, and no target has been specified for it. One or the other must be specified.

"ERROR -- EOF ENCOUNTERED WHILE READING GUN TYPE DEFINITION CARDS"

A star ("*") was encountered in the middle of a set of gun type cards instead of at the end.

"ERROR -- NO POSITIVE CHARGE FOR GUN TYPE _x_"

Improper definition; gun with code _x_ has been defined with all zero or negative charge sizes.

"ERROR -- _x_ NEG CHARGES ENCOUNTERED"

_x_ number of negative charge sizes have been found among the gun type cards.

"WARNING -- _x_ CHARGES LARGER THAN ___ LBS"

_x_ number of charge sizes greater than a given size; currently the message is for 50 lb.

"ERROR -- DUPLICATE ID; FIRST OCCURRENCE USED FOR TABLE."

The same firing-point ID occurs in two (or more) places in the input data. MAP uses only information from the first appearance in the cross-reference tables. A new ID (such as jj) will be generated and used in the cross-reference table for this firing point.

"WARNING -- EXTRANEOUS DATA STARTING IN CARD COL., _x_,;
CHECK ALL FIELDS"

Some characters for this definition card are found in columns where they should not occur. This error is sometimes caused by an overturned card or by a missing FP1 card.

"ERROR -- HEIGHT CORRECTION DATA OUT OF RANGE"

The specified height correction factor is too big. This error is sometimes the result of typing a factor in the wrong column, causing a shift in the decimal point.

"WARNING -- DUP-POINT: IDENTICAL COORDINATES"

The same point has occurred a second time in the input data. This is the result of using different IDs for the same coordinates.

"ERROR -- TARGETS EXCEED TABLE LIMIT IN MAP; ONLY FIRST _x_
USED FOR SUBSEQUENT CROSS-CHECKING"

Too much data has been input; only the first _x_ is allowed in the table.

ERROR -- FIRINGS DATA NEGATIVE OR BOTH ZERO ON DEF. CARD
FOR FIRING POINT _x_"

No rounds or a negative number of rounds have been specified for the amount fired per day and night for firing point _x_; i.e., either there are blanks in both the day and night columns on an FP-2 card, or a negative number has been entered.

"ERROR -- INVALID CHARGE NO.: NONPOSITIVE OR NO GUN TABLE ENTRY; DEF. CARD FOR FIRING PT. _x_ "

A gun for firing point _x_ has been improperly defined; either a negative or zero charge size has been given for the range specified, or the charge range is wrong for the specified gun type.

"WARNING -- LARGE HEIGHT VALUE IN DEF. CARD FOR FIRING POINT _x_ "

The height correction factor specified is very big, and should be verified.

"ERROR -- FIRING POINTS EXCEED TABLE LIMIT IN MAP; ONLY FIRST ___ USED FOR SUBSEQUENT CROSS-CHECKING"

Too much input data has been given; the current limit is ___.

"WARNING -- DUE TO PREVIOUS TABLE OVERFLOW, THE FOLLOWING CROSS-REFERENCE TABLE IS INCOMPLETE"

One set of definition cards was too big, so MAP used only part of it to compile the given table.

"ERROR -- DUPLICATE ID, COORDINATES; DEF. CARDS CHECKED FOR ERRORS, BUT OTHERWISE IGNORED"

The same firing point has been specified more than once; MAP ignores additional occurrences.

"ERROR -- DUPLICATE ID, DIFFERENT COORDINATES; TREATED AS SEPARATE ENTRY."

The same firing-point ID is defined with different coordinates and is being considered as two points. A new firing-point ID (such as j*i) has been created and will be used in the cross-reference tables.

"ERROR -- NONPOSITIVE CHARGE NOS. ENCOUNTERED FOR FIRING PT. ___."

The specified charge ranges are negative.

"ERROR -- NONPOSITIVE TARGET CHARGE IN TABLE FOR GUN _x_; DEF. CARD FOR FIRING POINT _y_ "

The projectile charge size for a given specified gun _x_ for a firing point y is negative or zero.

"ERROR -- MISSING DATA BASE FILE; EXECUTION ABORTED"

A USER'S RUN program was created which invoked modules but did not provide any input data section.

PLOT Module

"THE FOLLOWING FILES WERE REQUESTED BUT NOT AVAILABLE -- JOB ABORTED.."

Output from one of the BASE, SCATTER, LOCATOR, or PUDDLE GRID modules was requested in the PLOT module when it had not been produced by one of these modules previously.

"WARNING...PUDDLE GRID BOUNDS DO NOT MATCH SPECIFIED BOUNDS...

PGRID VALUES USED	SPECIFIED BOUNDS
A	A2
B	B2
C	C2
D	D2

The user specified one set of bounds, while PUDDLE GRID chose some other values; this usually occurs as a result of the user-specified GRID size. If the x values of the specified bounds were 20 000 and 43 000 m, and if the grid size was 2000 m, then the PGRID values used are 20 000 and 44 000 m, since the difference between the two must be a multiple of 2000. This error can also occur if the PUDDLE GRID was saved on disk and the program was run again later.

PUDDLE GRID Module

"***WARNING -- SPECIFIED BOUNDS x,y, x,y DO NOT CORRESPOND TO INTEGRAL GRID BOUNDS. MODIFIED BOUNDS WILL BE USED TO PRODUCE THE GRID AND TO DEFINE ANY PLOT UTILIZING THIS GRID"

The grid size specified by the user does not divide the bounds evenly. PUDDLE GRID extends the bounds, and does divide the bounds evenly. (See PLOT errors.)

"***WARNING -- GRID SIZE ___ NOT MULTIPLE OF ___"

An inappropriate grid size was chosen.

"***ERROR -- MISSING INPUT DIRECTIVE; JOB ABORTED"

One of the module cards is missing.

"***ERROR -- TARGET TABLE OVERFLOW: EXECUTION ABORTED"

There is too much input data. The current limit is 30.

"***ERROR -- ERROR IN DATA BASE: UNDEFINED TARGET ID -- ;
EXECUTION ABORTED"

A target-point ID has been given with no subsequent information.

"***WARNING -- EITHER TARGETS OR FIRING PTS. MUST BE REQUESTED;
EXECUTION CONTINUES WITH DEFAULT = BOTH"

The user did not supply the required information, so the computer will supply it.

"***ERROR -- PREMATURE EOF ON TAPE ___; EXECUTION ABORTED"

A "789" specification is encountered in the wrong spot.

"***ERROR -- GUN OPTION SELECTED BUT NO GUN TYPES SPECIFIED:
EXECUTION ABORTED"

The user requested an option, but did not supply all required information.

3 EXAMPLE OF A BLAST NOISE PROGRAM RUN

This chapter presents a sample run of the Blast Noise program and includes samples of both input and output. This example does not include data collection, but does show what the user should do with the operational data when he has received it. The example also describes what output the user wanted from the sample data and the output that the computer produced as a result of his instructions.

Data Received

These data were obtained from the hypothetical installation "SHOW" for the month of June (30 days). A map of the installation in metric coordinates (Figure 5) was received with the data. Four types of activities occurred during this time, and five sites were involved in these activities. Weapons were fired from three firing points toward two target points.

The first activity used a 155-mm self-propelled howitzer (M109) to fire 160 rounds from firing point 2 (located at coordinates 35000, 20000) to target point 2 (located at coordinates 32000, 25000). One hundred and fifty of the rounds were fired during the day (0700 to 2200 hours), and 10 were fired at night (2200 to 0700 hours). Charge zones 4 and 5 were used for this weapon. The second activity used an 81-mm mortar which fired 325 rounds from firing point 1 (located at coordinates 29000, 23000) to target point 2. All 325 projectiles were nonexploding, i.e., smoke or illumination. Three hundred of the rounds were fired during the day, and 25 were fired at night, using charge increments of 3 to 7. The third activity involved demolitions at firing point 3, located at coordinates 32000, 28000. There were 100 daytime explosions, each of which set off 15 lb (6 kg) of ammunition. The last activity used a nonstandard weapon (not listed in Table 1). It fired 17 nighttime rounds from firing point 1 to target point 1 (located at coordinates 27000, 25000), using charge zones 3 and 4. All rounds exploded 100 ft (30 m) above the target. The user learned that this weapon fires a projectile containing 105 lb (42 kg) of explosive, and has six charge zones containing 1.2, 3.4, 5.7, 7.3, 9.2, and 12.1 lb (.48, 1.36, 2.28, 2.92, 3.68, and 4.84 kg) of propellant in zones 1 through 6, respectively. The user wants to locate a set of $L_{C_{dn}}$ contours for this set of data and have an outline of the installation drawn on them for reference. In addition, he wants an indication of the activities' magnitude and location.

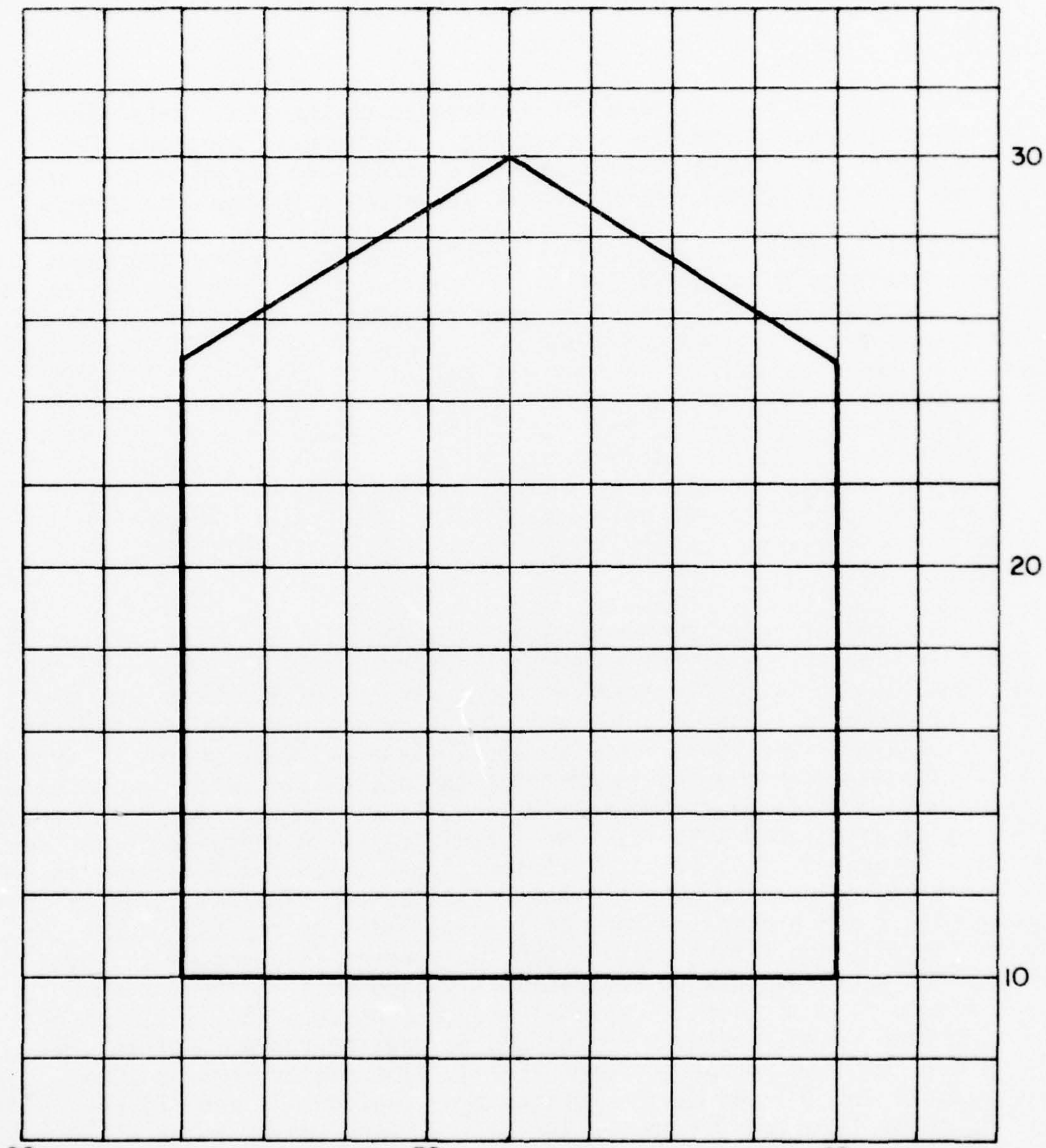

Figure 5. Military installation "SHOW."

Creating the USER'S RUN

JCL Cards

First, the user obtains an account number for his run. He then types a set of JCL cards as described on pp 12-13. These are the first set of cards in his deck, as shown on p 11.

Input Data Cards

The next section of the deck is composed of the input data cards the user has created from the operational data he has received. For this example, there will be four gun type cards, two target-point cards, and three firing points, which require seven cards to describe them.

Tables 1 and 2 provide information for the first three gun types, which correspond to standard weapons in the example. The last weapon is not on the list, since it is not a standard weapon; therefore, the user must create his own weapon code and gun type card for it from the information he has received. (The four gun type cards are shown in Figure 6.) A weapon code of 80 was chosen and typed into columns 2 and 3 of that gun type card (gun-d); the rest of the information was typed into the appropriate columns, as shown in Table 3. A "*" was placed in column 1 of that card, since it is the last gun type card. Following the gun type cards, target-point cards (TRG-1a,b) were created using Table 4. Short target point names were made up to fit into the allocated columns.

Two types of cards are associated with each firing point. Cards of type FP-1 (Table 4) give the name and location of the firing point. In the example, shortened firing-point names were created to fit into the allocated columns. The location information which was received and the shortened names were typed into the appropriate columns. Cards of type FP-2 (Table 4) were created to describe the activities occurring at each firing point. Each FP-1 card must have at least one, but may have many, FP-2 cards associated with it. Two activities which differ only in "no. of day firings" or "no. of night firings," but which are identical in all other descriptions, may be typed either as two separate cards or on one card, in which case the "no. of firings" will be the sum of the two activities. Since firing point 1 had two weapons firing from it, two FP-2 cards were required to describe activities there. The first one (see Figure 6) described the special weapon (gun type "80"). It fires 17 nighttime rounds (columns 25-28) and no daytime rounds (columns 25-28) and no daytime rounds (columns 21-24). The minimum charge zone (columns 29 and 30) and maximum charge zone (columns 31 and 32) are 3 and 4, respectively. The weapon was fired toward target point (TP1) (columns 33-35). All rounds exploded 100 ft (30 m) above the ground (columns 37-41) at the target point.

DATE ______________ 80 COLUMN KEY PUNCH TRANSCRIPT LAYOUT SHEET SHEET ____ OF ____ SHEETS

CARD ID	
JCL	PWSVP,CM160000,T200,P2.
JCL	CHARGE,PUWS,EDULU18980,RS,I.
JCL	ATTACH(PROCFIL,NEFPROFIL,ID=PUWS)
JCL	ATTACH(TAPE20,TAPE20,ID=PUWS)
JCL	UPDATE,N,D,C=TAPE7.
JCL	BEGIN,NEFPROC.
JCL	BEGIN,PLOT.
EOR	789
	*DECK SHOW
GUN_a	215.4 1.7687 2.2875 3.0875 4.025 7.025 9.8375 13.27 20.34
GUN_b	22 2.25 .042 .0653 .0886 .1119 .1352 .1585 .1818 .1941 .2284
GUN_c	10 .25 1.0 5.0 10.0 15.0 25.0 35.0 50.0 70.0 90.0
GUN_d	*8010.5 1.2 3.4 5.7 7.3 9.2 12.1
TRG-1_a	TP1 27000 25000
TRG-1_b	* TP2 32000 25000
FP-1_a	FP1 29000 23000
FP-2_a	80 17 3 4TP1 100.
FP-2_b	* 22 300 25 5 7TP21
FP-1_b	FP2 35000 20000
FP-2_c	* 2 150 10 4 5TP2

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Figure 6. Input data cards.

DATE ______________ 80 COLUMN KEY PUNCH TRANSCRIPT LAYOUT SHEET SHEET OF SHEETS

CARD ID	Card contents
FP-1c	FP3 32000 28000
FP-2d	* 10 100 5 5 1
EOR	7 8 9
NEF-1	METERS
MAP-1	MAP
MAP-2	11111
MAP-3	30.
MAP-4	01
MAP-5	250.
BDS-1	BOUNDS
BDS-2	14000. 0.
BDS-3	50000. 39000.
BASE-1	BASE
BASE-2a	19000. 8000.
BASE-2b	21000. 8000. *
BASE-2c	20000. 7000.
BASE-2d	20000. 9000. *
BASE-2e	24000. 10000.
BASE-2f	40000. 10000.
BASE-2g	40000. 25000.

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20 April 1975

Figure 6. (cont'd).

DATE ______________ 80 COLUMN KEY PUNCH TRANSCRIPT LAYOUT SHEET SHEET ___ OF ___ SHEETS

CARD ID							
BASE-2h	32000.	30000.					
BASE-2i	24000.	25000.					
BASE-2j	24000.	10000.	*				
BASE-3			*				
FRMA-1	FORM-A						
FRMA-2	MAX						
FRMA-3	30.						
PGRD-1	PUDDLE GRID						
PGRD-2	65.8	15.5	27.9	2000.			
SCT-1	SCATTER						
SCT-2	TFB					2.	300.
SCT-3	30.						
LOC-1	LOCATOR						
LOC-2	ALL						
PLT-1a	PLOT						
PLT-2a	1101						
PLT-3a	50000.	.3	55 75	55 75			
PLT-6a							*
PLT-1b	PLOT						
PLT-2b	0011						

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20 April 1975

Figure 6. (cont'd).

DATE ____________ 80 COLUMN KEY PUNCH TRANSCRIPT LAYOUT SHEET SHEET OF SHEETS

CARD ID	1–6	17–18	25–26	28–29	31–32	34–35	80
PLT-3b	50000.	.3	55	75	55	75	
PLT-6b							*
	STOP						
EOI	67 89						

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20 April 1975

Figure 6. (cont'd).

Card FP-2b described the 81-mm mortar (gun type 22). The number of rounds, charge zones, and target point were typed into the appropriate columns. In addition, a "1" was typed in the "no noise at target flag" column, since the rounds were noiseless, i.e., smoke or illumination. The second firing point had only one activity, so only one FP-2 type card was required (FP-2c). This card described the activities of the 155-mm howitzer. The number of rounds it shoots, charge zones, and target point were typed into the appropriate columns.

The only activity at firing point 3 was demolition. A 15-lb (6-kg) explosive corresponds to charge zone 5 for the standard gun type card which has been created for small demolition (gun type "10"). Card FP-2d described the demolition. The number of rounds and the minimum and maximum charge zones were typed into the appropriate columns. The target point, which was left blank, and the "1" in column 36 signified an omnidirectional noise at the firing point. Cards FP-2b, FP-2c, FP-2d, all had a "*" in column 1, since they were the last cards associated with each firing point.

The input data portion of the deck consisted of the gun type, target point, and firing point definition cards, respectively, preceded by a card with *DECK *basename*; *basename* in this example was "SHOW".

Module Cards

The final portion of the deck consisted of the module cards, which tell the computer what it must do with the input data. In this example, the data were checked and several types of plots were generated. The first plot (Figure 7) had an outline of the installation with target and firing points marked, along with the $L_{C_{dn}}$ contours for the area. The second plot (Figure 8) had the installation outline and a noise density plot (scattergram).

All grid coordinates are given in metric units, so the first card (NEF-1) must contain the specification "METERS". Next, a MAP-1 card invokes the MAP module, which checks the data and produces cross-reference tables. The MAP-2 card has a "1" in columns 1 through 5, requesting all of the cross-referenced tables. The number of days (30) is entered on the MAP-3 card. The MAP-4 card is set to "01", and MAP-5 is set to "250", since the cost is not of interest for this run. The BOUNDS module must be invoked before most of the other modules can be entered. This is accomplished by the BDS-1 card. The coordinates of the lower left-hand corner of the rectangular area under consideration are 14000, 0 and the upper right ones are 50000, 39000. These values are entered on cards BDS-2 and BDS-3, respectively.

The BASE module is used to produce an outline of the installation. In this example, the user also wanted a registration mark (+) on the plot so that it could easily be overlaid on a map of the area. The BASE

PWSVP40 04/25/79 PLOT 1 1 OF 1

SCALE 1: 50000. 1 INCH= 1270. METERS

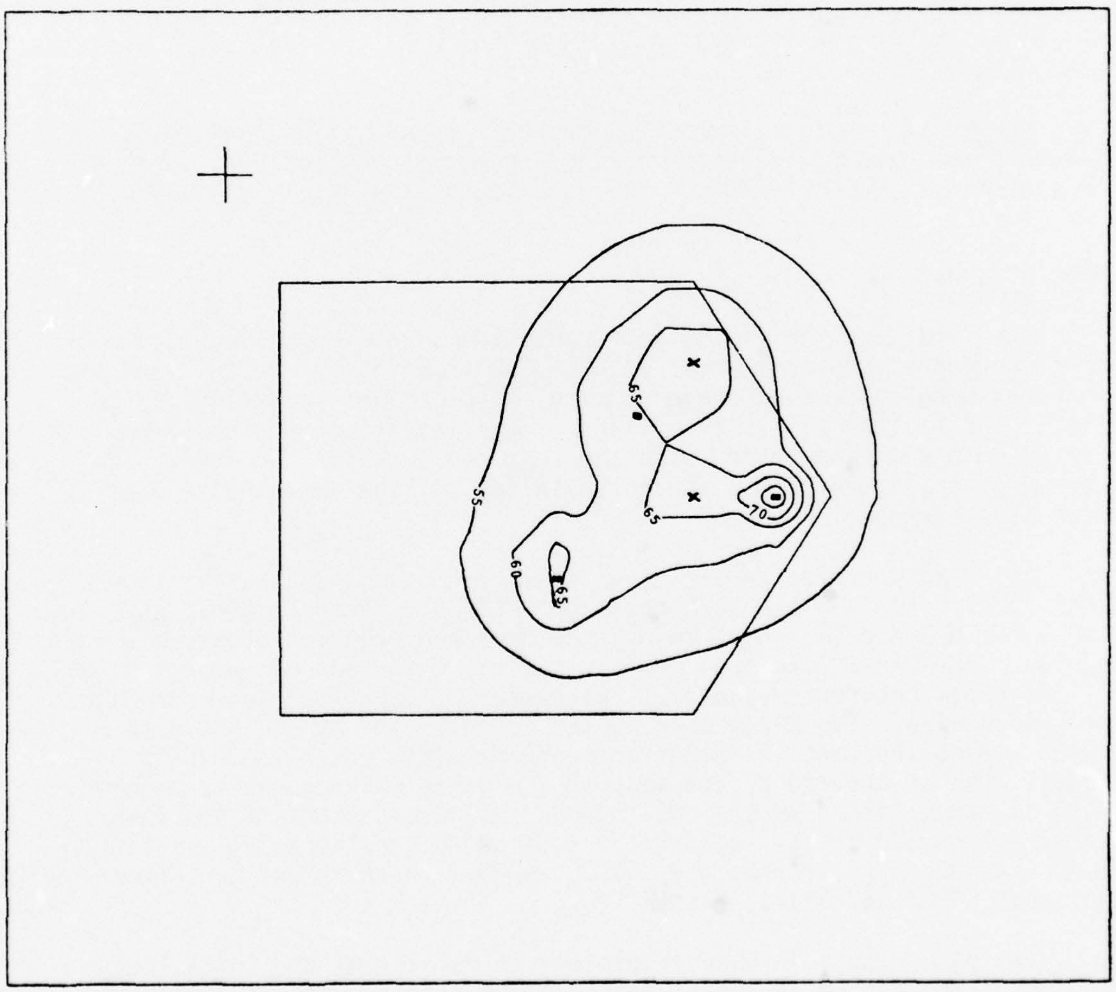

Figure 7. $L_{C_{dn}}$ contours for base "SHOW."

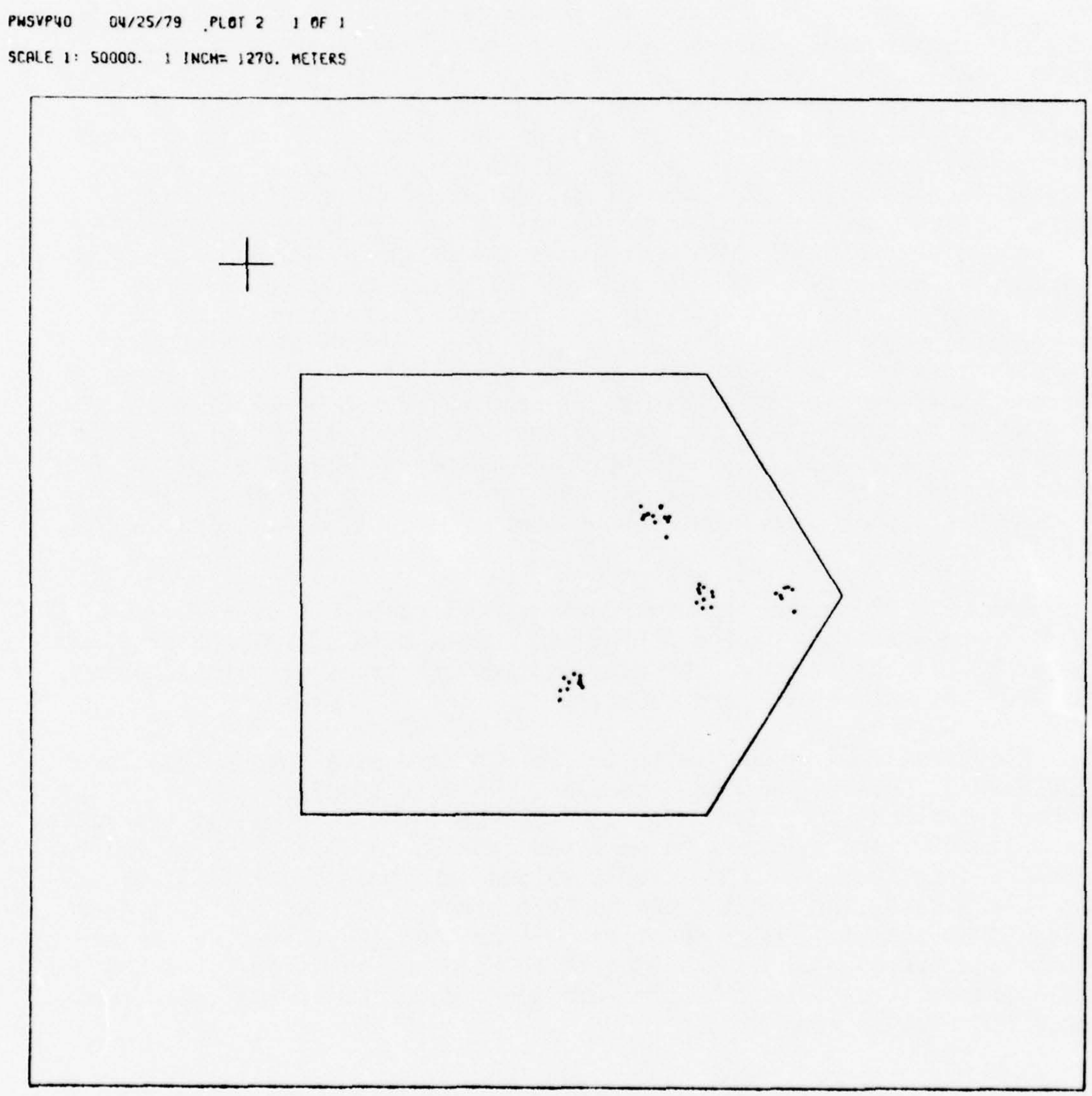

Figure 8. Scattergram output for base "SHOW."

module is invoked with the BASE-1 card. The horizontal registration line is defined with the BASE-2a and BASE-2b cards. The star ("*") in column 21 of BASE-2b indicates the end of that line segment. Cards BASE-2c and BASE-2d define the vertical registration line. BASE cards BASE-2e through BASE-2j define the installation outline. Since the line segments of the installation outline are connected, only the last (BASE-2j) card needs a "*" in column 21 to indicate the end of the figure. The BASE-3 card indicates to the program that there is no more input for the BASE module.

The FORM-A and PUDDLE GRID modules must be included to produce a contour. FORM-A must precede PUDDLE GRID, since PUDDLE GRID uses the output from FORM-A. A FRMA-1 card is used to invoke the FORM-A module. "MAX" is chosen as the parameter on the FRMA-2 card, since the user would like to investigate the worst case of his operations. The number of days (30) is typed on the FRMA-3 card. PUDDLE GRID may now be invoked with the PGRD-1 card. The closest city (both geographically and meteorologically) to the installation "SHOW" is Midland, TX. The inversion factors 65.8, 15.5, and 27.9 are found in Table 14. These values are entered into columns 1-10, 11-20, a[illegible] 21-30 on card PGRD-2. The grid size chosen is 2000 m (columns 31-40, card PGRD-2). The SCATTER module, which is invoked with an SCT-1 card, generates a representation of the noise density by drawing dots in proportion to the number of operations. All day and night firing from both firing and target points will be considered. Thus, "T", "F", and "B" are typed in columns 1, 2, and 3, respectively, of card SCT-2. A multiplier of "2" is used to help represent the operations visually (columns 61-70, card SCT-2). The computer does not currently supply a default value for the standard deviation (columns 71-80, card SCT-2). The value of "300" is recommended and is used here. The number of days (30) is typed on the SCT-3 card.

The LOCATOR module is invoked with LOC-1 card. It uses "O" and "X" to mark the locations of the firing and target points, respectively, on the plot. In the example, the user wanted both types of points marked, so "ALL" was entered on card LOC-2.

The first PLOT invoked with the PLT-1a card uses output from the PUDDLE GRID, LOCATOR, and BASE modules. This is specified by the "1" placed in columns 1, 2, and 4 of card PLT-2a. The user wanted the scale to be 1:50000, and contours to be drawn from 55 to 75 dB in 5-dB increments. Since those are the default values for these specifications on the PLT-3a card, the columns can be left blank. Columns 16-19 of card PLT-3a show that a .3 magnification will be used (this is done for reproduction purposes). No labeling is to be done, so cards PLT-4 and PLT-5 are omitted. The "*" in column 80 of card PLT-6a indicates that the first plot is completed.

The second plot, invoked with the PLT-1b card, uses output from the SCATTER and BASE modules, and is specified by the "1" typed in columns 3 and 4 of card PLT-2b. The user wanted the resultant drawing to be the same size as the first plot, so the specifications on the PLT-3b card were the same as those used on the PLT-3a card. Again, there were no labels to be printed, so the PLT-4 and PLT-5 cards were omitted. The PLT-6b card signified that the second plot was completed.

The STOP module, which is invoked with the STP-1 card, indicates that the user has finished providing instructions for that run. The USER'S RUN consists of the JCL, input data, and module cards, respectively, separated by the "789" cards. A final card, which has a 6789 typed in the first column, signifies the end of information to the computer.

Output Received

The user received several pages of site-dependent information from the computer at the beginning and end of his output (see p 40). These pages, which may include local ADP announcements and billing information, are not shown here, since this report is concerned only with the Blast Noise program.) The user's output is shown as Figure 9, pages A through T.

The first page of output (page A) tells the user the units of his coordinates. Note that height/depth information is always in feet. This output was generated by the NEF-1 card.

The next module is MAP. Since the user in the example requested that the data be listed, it was printed out on pages B, C, and D. The gun type cards were listed on page B. The warning (not necessarily an error) on page B was generated, since two of the charges were greater than 50 lb (20 kg). In this example, it is not an error, since the user did want 70 and 90 lb (28 and 36 kg) for charge zones 9 and 10 of gun type 10. Page C lists the target points; page D lists the firing-point information and gives the total number of errors and warnings found in the input data.

Page E summarizes the input data read, showing how many gun type, target, and firing-point cards were read. It provides statistics on the number of total firings and the number of firings per day for both day and night. Charge information about minimum and maximum charge zones and weight are also given. The average weight of firings is given in pounds, and the maximum height and depth are given in feet. The maximum and minimum values for coordinates read are given, along with the coordinate pair in which each occurs. The final item on Page E is the number of points resulting from the grid size specified in MAP.

```
                                    PAGE A
                          .....     NEF PHOGRAM     .....


                                DISTANCES EXPRESSED IN METERS



                                    PAGE B
          .....     MAP OF SOUHCE POINTS     .....

          .....     GUN TYPE CARDS     .....
       FLAG  G TYPF  T CHAHGE  CHAHGES

             2      15.40      1.77     2.29     3.09     4.03     7.03     9.84    13.27    20.34     0.00     0.00
            22       2.25       .04      .07      .09      .11      .14      .16      .18      .19      .23     0.00
            10       0.00       .25     1.00     5.00    10.00    15.00    25.00    35.00    50.00    70.00    90.00
------   WARNING --   2 CHAPGES LARGEH THAN 50. LBS
        *   80      10.50      1.20     3.40     5.70    '7.30     9.20    12.10     0.00     0.00     0.00     0.00

------  2 ERROR/WARNING CONDITIONS DETECTED FOR THIS CARD TYPE
```

Figure 9. Printed output.

```
                                   PAGE C

                     .....      TARGET CARDS       .....

                  FLAG    ID       X          Y      HT CORR

                          TP1    27000.    25000.      0.
                    •     TP2    32000.    25000.      0.

               ~~~~~   0 ERROR/WARNING CONDITIONS DETECTED FOR THIS CARD TYPE


                                   PAGE D

        .....      FIRING PT. SOURCE AND DEFINITION CARDS      .....

  FLAG     ID      X        Y      HT CORR  G TYPE  DAYNO  NIGHTNO  MIN  MAX  T ID  FLAG  HGT

           FP1   29000.   23000.     0.
                                              80      0.0    17.0     3    4   TP1    0  100.0
    •                                         22    300.0    25.0     5    7   TP2    1    0.0
           FP2   35000.   20000.     0.
    •                                          2    150.0    10.0     4    5   TP2    0    0.0
           FP3   32000.   28000.     0.
    •                                         10    100.0     0.0     5    5          1    0.0

~~~~~   0 ERROR/WARNING CONDITIONS DETECTED FOR THIS CARD TYPE

..... END OF INPUT PHASE:   2 ERROR/WARNING CONDITIONS DETECTED
```

Figure 9 (cont'd).

PAGE E

```
NUMBER OF DATA BASE CARD IMAGES READ IS    13

NUMBER OF GUN TYPES READ IS      4

NUMBER OF TARGETS READ IS      2

NUMBER OF SOURCES READ IS      3


.....     DATA BASE TIME PERIOD:  30. DAY(S)

TOTAL DAY FIRINGS IS         550.00
TOTAL NIGHT FIRINGS IS        52.00

TOTAL PER DAY DAY FIRINGS IS          18.33
TOTAL PER DAY NIGHT FIRINGS IS         1.73

MINIMUM CHARGE NUMBER     3
MAXIMUM CHARGE NUMBER     7

MINIMUM CHARGE WEIGHT         .1 LBS
MAXIMUM CHARGE WEIGHT       15.0 LBS

AVERAGE DAILY CHARGE WEIGHT      257.4 LBS

MAXIMUM HEIGHT IS      100.00
MAXIMUM DEPTH IS         0.00


MAXIMUM X IS    35000.0 IN PAIR  (   35000.0 ,    20000.0 )

MAXIMUM Y IS    28000.0 IN PAIR  (   32000.0 ,    28000.0 )

MINIMUM X IS    27000.0 IN PAIR  (   27000.0 ,    25000.0 )

MINIMUM Y IS    20000.0 IN PAIR  (   35000.0 ,    20000.0 )

 FOB GRID SIZE    250.0, GRID DIMENSIONS =    32.0 X    32.0
```

Figure 9 (cont'd).

PAGE F

CROSS-REFERENCE: TARGETS BY FIRING POINTS : DAILY FIRINGS

TARGET ID	FPT ID		FPT ID		FPT ID		FPT ID		FPT ID		FPT ID		FPT ID	
TP1	FP1	.6												
TP2	FP1	10.8	FP2	5.3										

PAGE G

CROSS-REFERENCE: TARGETS BY GUN TYPES : DAILY CHARGE WEIGHT (LBS)

TARGET ID	GUN ID		GUN ID		GUN ID		GUN ID		GUN ID		GUN ID		GUN ID	
TP1	80	6.0												
TP2	2	82.1	22	24.4										

Figure 9 (cont'd).

PAGE H

CROSS-REFERENCE: GUN TYPES BY TARGETS : DAILY CHARGE WEIGHT (LBS)

GUN ID	TAR ID		TAR ID	TAR ID	TAR ID	TAR ID	TAR ID	TAR ID
2	TP2	82.1						
22	TP2	24.4						
10	***							
80	TP1	6.0						

PAGE I

CROSS-REFERENCE: GUN TYPES BY FIRING POINTS : DAILY CHARGE WEIGHT (LBS)

GUN ID	FPT ID		FPT ID	FPT ID	FPT ID	FPT ID	FPT ID	FPT ID
2	FP2	37.5						
22	FP1	2.0						
10	FP3	50.0						
80	FP1	4.1						

..... TIME FOR MAPPING SUBPROGRAM IS .595 SECONDS

Figure 9 (cont'd).

```
                         PAGE J

               .....    BOUNDS    .....

MINIMUM BOUNDARY =   14000.      0.     MAXIMUM BOUNDARY =   50000.  39000.
BOUNDARY VALUES VERIFIED
 ..... TIME IN BOUNDS IS    .016 .....



                         PAGE K

                  .....     BASE     .....


                       LINE CARDS

            X-Y START                                   X-Y END
 LINE    19000.   8000.                              21000.   8000.

  NEW LINE
 LINE    20000.   7000.                              20000.   9000.

  NEW LINE
 LINE     24000.  10000.                             40000.  10000.
 LINE     40000.  10000.                             40000.  25000.
 LINE     40000.  25000.                             32000.  30000.
 LINE     32000.  30000.                             24000.  25000.
 LINE     24000.  25000.                             24000.  10000.

  ..... TIME IN BASE IS    .129 .....
```

Figure 9 (cont'd).

```
                                   PAGE L
      .....      FORM-A CALCULATION        .....

      .....      FOR TNT EQUIVALENT, FORM-A WILL USE MAXIMUM CHARGE ZONE

      .....      DATA BASE TIME PERIOD:  30. DAY(S)


                 NUMBER OF UNIQUE NOISE SOURCES COUNTED IS      6

      TOTAL PER DAY DAY FIRINGS IS          23.33
      TOTAL PER DAY NIGHT FIRINGS IS         2.63

      .....      TIME FOR FORM-A SUBPROGRAM IS     2.763 SECONDS


                                   PAGE M
 .....      PUDDLE GRID     .....

.....   WARNING -- SPECIFIED BOUNDS (  14000.0,       0.0 )(  50000.0,  39000.0 ) DO NOT CORRESPOND TO INTEGRAL GRID BOUNDS.
                MODIFIED BOUNDS WILL BE USED TO PRODUCE THE GRID AND TO DEFINE ANY PLOT UTILIZING THIS GRID


        START AT DATA BASE COORDINATES (  14000.0,       0.0 )

        STOP  AT DATA BASE COORDINATES (  50000.0,  40000.0 )

             INVERSION =   65.80   15.50   27.90

        CALCULATIONS FOR NEF WILL USE BOTH D + N OF DAY AND NIGHT CALCULATIONS


        GRID SIZE =  2000.0 ; DISTANCES IN METERS
```

Figure 9 (cont'd).

PAGE N

	14000	16000	18000	20000	22000	24000	26000	28000	30000	32000	34000	36000	38000	40000	42000
40000	45.1	45.8	46.4	47.0	47.5	47.9	48.2	48.4	48.5	48.3	48.1	47.9	47.4	46.8	46.1
38000	45.8	46.5	47.2	47.9	48.5	48.9	49.3	49.5	49.6	49.6	49.3	48.9	48.3	47.8	47.0
36000	46.4	47.2	48.0	48.8	49.5	50.0	50.5	50.8	51.0	50.9	50.6	50.1	49.4	48.7	47.9
34000	46.9	47.9	48.8	49.6	50.4	51.2	51.9	52.3	52.5	52.4	52.0	51.4	50.5	49.6	48.7
32000	47.3	48.4	49.4	50.5	51.5	52.6	53.5	54.1	54.5	54.4	53.8	52.7	51.6	50.4	49.3
30000	47.7	48.9	50.0	51.3	52.8	54.4	55.8	56.5	57.1	58.1	56.2	54.2	52.7	51.3	49.9
28000	47.9	49.2	50.4	52.1	54.1	56.7	59.4	60.0	60.3	84.9	59.0	55.7	53.6	52.0	50.5
26000	48.1	49.4	50.7	52.5	55.1	59.1	65.8	66.2	62.9	67.2	60.9	56.8	54.4	52.4	50.9
24000	48.0	49.3	50.7	52.5	55.1	59.2	66.0	68.0	65.0	67.2	61.1	57.5	55.0	52.8	51.1
22000	47.8	49.0	50.3	51.9	54.1	56.9	60.2	63.6	62.6	60.6	61.8	59.8	55.7	53.2	51.2
20000	47.5	48.6	49.8	51.1	52.7	54.6	56.5	57.9	58.0	58.6	66.2	65.2	56.2	53.0	50.9
18000	47.0	48.1	49.2	50.2	51.4	52.6	53.9	54.7	55.2	56.1	58.4	57.3	54.1	51.9	50.3
16000	46.5	47.5	48.5	49.3	50.3	51.2	52.0	52.6	53.1	53.7	53.9	53.3	52.0	50.6	49.4
14000	46.0	46.8	47.6	48.5	49.3	50.0	50.6	51.1	51.4	51.6	51.6	51.1	50.2	49.4	48.4
12000	45.4	46.2	46.9	47.6	48.3	48.9	49.3	49.7	50.0	50.1	49.9	49.5	48.9	48.3	47.4
10000	44.7	45.4	46.2	46.7	47.3	47.9	48.2	48.5	48.7	48.6	48.5	48.2	47.7	47.1	46.4
8000	44.2	44.7	45.4	45.9	46.4	46.9	47.2	47.4	47.5	47.5	47.4	47.0	46.6	46.1	45.5
6000	43.5	44.1	44.6	45.0	45.5	45.9	46.1	46.4	46.4	46.3	46.2	45.9	45.5	45.1	44.6
4000	42.8	43.4	43.8	44.2	44.6	44.9	45.2	45.3	45.3	45.4	45.2	44.9	44.6	44.2	43.6
2000	41.8	42.3	43.0	43.4	43.7	44.0	44.2	44.2	44.3	44.3	44.1	43.8	43.4	43.1	42.5
0	40.9	41.4	41.9	42.4	42.6	43.0	43.1	43.2	43.3	43.1	43.1	42.8	42.3	42.0	41.5

PAGE O

	44000	46000	48000	50000
40000	45.4	44.7	43.7	42.7
38000	46.3	45.5	44.5	43.5
36000	47.1	46.2	45.3	44.2
34000	47.7	46.8	45.8	44.8
32000	48.4	47.4	46.3	45.2
30000	48.8	47.8	46.8	45.6
28000	49.2	48.1	47.1	45.9
26000	49.5	48.3	47.3	46.1
24000	49.7	48.4	47.4	46.1
22000	49.7	48.4	47.2	46.1
20000	49.5	48.2	47.1	45.9
18000	49.0	47.7	46.6	45.5
16000	48.2	47.2	46.1	45.1
14000	47.5	46.4	45.5	44.4
12000	46.5	45.7	44.9	43.8
10000	45.6	45.0	44.1	43.0
8000	44.8	44.0	43.2	42.4
6000	43.9	43.2	42.3	41.6
4000	43.0	42.2	41.5	40.8
2000	41.9	41.4	40.6	39.9
0	41.0	40.3	39.8	39.0

..... TIME FOR PUDDLING SUBPROGRAM IS 6.038 SECONDS

Figure 9 (cont'd).

```
                          PAGE P
               .....     SCATTER     .....


THE SCATTER DIAGRAM WILL REPRESENT ..DAY+NIGHT.. DATA FOR:


         ...TARGETS
         ...FIRING PTS
         ...ALL GUN TYPES

BOUNDED BY (  14000.0,       0.0) - (  50000.0,  39000.0)


    ...MULTIPLIER =        2.0

    ...STANDARD DEVIATION =    300.000

    ... 30. DAYS DATA IN DATA BASE


OUTPUT FILE TAPE4 CONTAINS NASAPLOT PFS4 INPUT DATA REPRESENTING:

        2 TARGETS   :    12 SCATTER PTS.
        3 FIRING PTS:    41 SCATTER PTS.

    MULTIPLIER USED =        2.0


               .....     TIME IN SCATTER IS    .376 SECONDS


                             PAGE Q
                .....     LOCATOR      .....
                   ..OPTIONS REQUESTED..

                     TARGET
                     FIRING POINT

                      SIZE=  .14**      ANGLE=  0.00**
                      STARS INDICATE DEFAULT VALUES

                     ID CODE          X COORD.      Y COORD.      G CORR.
    ..TARGET DATA..

                      TP1              27000.        25000.          -0.
                      TP2              32000.        25000.          -0.
    ..FIRING POINT DATA..

                      FP1              29000.        23000.          -0.
                      FP2              35000.        20000.          -0.
                      FP3              32000.        28000.          -0.
               .....    .119 SECONDS IN LOCATOR   .....
```

Figure 9 (cont'd).

```
                              PAGE R

                   .......      PLOT       .......

                   PWSVP40      17.33.46.   04/25/79

              FOLLOWING FILES WERE REQUESTED

                   PGRID
                   BASE
                   LOCATOR

WARNING...PUDDLE GRID BOUNDS DO NOT MATCH SPECIFIED BOUNDS...

                 PGRID VALUES USED           SPECIFIED BOUNDS
     XMIN           14000.00                     14000.00
     YMIN               0.00                         0.00
     XMAX           50000.00                     50000.00
     YMAX           40000.00                     39000.00

                 VALUES USED BY PLOT

       **SCALE    =50000.0

       **PERCENT X=1.00           **PERCENT Y=1.00

         MAG      = .30           **PERC SMTH= .33

         START    = 55              STOP     = 75

         L START  = 55              L STOP   = 75

       **LABEL    = 1             **INCREMENT= 5

       **L INCREMT= 5               GRID SIZE= 2000.

        STARS INDICATE DEFAULT VALUES

        FOLLOWING CARDS WERE USER TEXT INPUT

        NO USER TEXT CARDS INPUT

        THIS PLOT IS   8 INCHES BY   9 INCHES

        ONE INCH IS EQUAL TO  1270. METERS

        IT CONSISTS OF  1 SECTIONS IN THE X DIRECTION AND  1 IN THE Y DIRECTION

          ..... TIME IN PLOT IS   1.620 .....
```

Figure 9 (cont'd).

```
                              PAGE 5
                 .......      PLOT       .......
                PWSVP40      17.33.49.   04/25/79
        FOLLOWING FILES WERE REQUESTED

             BASE
             SCATTER

             VALUES USED BY PLOT

  **SCALE     =50000.0

  **PERCENT X=1.00            **PERCENT Y=1.00

    MAG      = .30            **PERC SMTH= .33

    START    = 55               STOP     = 75

    L START  = 55               L STOP   = 75

  **LABEL    = 1              **INCREMENT= 5

  **L INCREMT= 5                GRID SIZE=     0.

   STARS INDICATE DEFAULT VALUES

   FOLLOWING CARDS WERE USER TEXT INPUT

   NO USER TEXT CARDS INPUT

   THIS PLOT IS   8 INCHES BY   9 INCHES

   ONE INCH IS EQUAL TO  1270. METERS

   IT CONSISTS OF  1 SECTIONS IN THE X DIRECTION AND  1 IN THE Y DIRECTION

     ..... TIME IN PLOT IS    .375 .....



                          PAGE T
                  .....    STOP    .....


               NASAPLOT INPUT FILE COMPLETED
```

Figure 9 (cont'd).

Pages F, G, H, and I are the cross-reference tables requested on the MAP-2 card. The first cross-reference table (targets by firing points) provides the average number of rounds fired by day for each target and firing-point combination. The second table lists targets by gun type and provides the average total weight exploding at each target for each gun type. The third table provides the same information as the second table, but in a different order -- gun types by targets. The last table lists gun types by firing point, giving the average daily charge weight of each combination. Page I also lists the amount of time that the computer spent on the MAP module.

Page J gives the information for the BOUNDS module, including the maximum and minimum coordinates and the amount of time spent by the computer in this module.

The BASE module output on page K shows the start and end coordinates for the lines to be drawn. It informs the user when a new figure is started and how much time the computer spent in this module.

Page L lists the FORM-A module output. First, it informs the user which charge averaging technique was used. It lists the number of days for the data base, as well as the number of unique noise sources, including the number of unique explosion types, i.e., unique combinations of height/depth, weight, location, and weapon types. All omnidirectional noise sources, i.e., demolitions and projectile explosions, are classified as the same type for the above statistic. The average number of rounds fired per day and night is given. In MAP, the number of explosions was given, which is always greater than or equal to the number of rounds. The amount of time spent in FORM-A is the last piece of information provided.

Page M -- the first page of the PUDDLE GRID output -- tells the user what the start and stop coordinates used by this module are. In this example, the limits had to be changed, since they were not an integral multiple of the grid size chosen. The new units are listed, along with a warning specifying that they were changed. The weather factors are listed, and PUDDLE GRID specifies that both day and night values are used in calculations. The grid size is also provided. A table of values is listed by coordinates in increments of grid size. This table is pages N and O. The amount of time spent in PUDDLE GRID is the last item printed.

Page P lists the SCATTER module's output, followed by the condition under which the scattergram is produced, i.e., day/night/both target/firing point/gun type. The limits of the scattergram are given next. The multiplier, standard deviation, and number of days are listed next, followed by a summary of what will be plotted, which tells how many dots will be plotted for both the firing points and target points. The amount of time spent in SCATTER is the last item printed.

The LOCATOR module output provides the options requested first (page Q), i.e., target/firing points, name, location. Next, the size and angle of the characters to be plotted are given, followed by a listing of the targets and firing points and the amount of time spent in this module.

Pages R and S give the PLOT output for plots 1 and 2, respectively. The first plot (page R) lists the file name used by the system and the date and time that the file was produced. This information is also drawn on the plot itself. For this plot, contours were drawn with a base outline, and the firing point and target points were overlaid. A warning is given about the bounds since PUDDLE GRID modified them. Values used by PLOT for its various parameters are listed. The values having a "*" are equal to default values. If any text cards had been included, they would have been listed next (see Table 10 pages 26 through 28, PLT-4 and PLT-5).

Finally, information concerning the physical plot is given, including the size, how many units (as specified by the NEF-1 card) 1 in. (25.4 mm) equals, and how many sections of plotter paper will be needed. The last piece of information is the amount of time spent in that module.

The second plot uses information from the BASE and SCATTER modules, and provides the same type of information given in the first plot.

The final page (page T) gives the STOP module's output, which states that the internally stored information is ready to be plotted.

Figures 7 and 8 are the plots produced by this run.

APPENDIX:

BLAST NOISE PROGRAM RETRIEVAL

Three routines have been created to bring the Blast Noise program in and out of storage if it is not kept permanently active at the installation. The user need not be concerned with the specifics of these programs, but rather only when to use them. The RESTORE routine retrieves the Blast Noise program from permanent storage, such as magnetic tape, and puts it onto the computer, ready to be used. The PURGE routine clears the program from active status in the computer. (If the user does not want to run the Blast Noise program for a long time, he can PURGE it to prevent accumulation of the costs associated with it being kept active.) Note: When the program is active, there are actually two copies in existence: one is active on the system, and one is in permanent storage. The BACKUP routine is used to recreate the program in permanent storage in case the stored version of the program is lost while the program is active on the system.

RESTORE for the Blast Noise Program

```
PWSVP,CM160000,T1000,P4,MT1.
CHARGE,PUWS,WPBVW18969,RS,I.
COMMENT. PROCEDURE TO RESTORE NEF FILES.
REQUEST,TPIN,MT,HY,NORING,VSN=CK0758.  REQUEST MOUNT OF BACKUP TAPE.
REQUEST,IN2,*PF.
REQUEST,IN3,*PF.
REQUEST,IN4,*PF.
REQUEST,IN5,*PF.
REQUEST,IN6,*PF.
COPYBF,TPIN,OUT.                                   COPY TAPE DESCRIPTION FILE.
REWIND,OUT.
COPYSBF,OUT,OUTPUT.                                PRINT IT.
COPYBF,TPIN,IN2.
COPYBF,TPIN,IN3.
COPYBF,TPIN,IN4.
COPYBF,TPIN,IN5.
COPYBF,TPIN,IN6.
COMMENT. CATALOG THE PFNS.
CATALOG,IN2,NEFPROFIL,ID=PUWS.
CATALOG,IN3,NEFABS,ID=PUWS.
CATALOG,IN4,TAPE20,ID=PUWS.
CATALOG,IN5,BIGPENPLOT,ID=PUWS.
CATALOG,IN6,NASAPLGO,ID=PUWS.
?           END OF INFORMATION
```

Note: 1. T200 should be sufficient instead of T1000.
2. The charge number changes periodically.

PURGE for the Blast Noise Program

```
PWSVP,CM160000.T1000,P4.
CHARGE,PUWS,1189056841,RS,I.

COMMENT.  PROCEDURE TO PURGE PERMANENT
COMMENT.  FILES NEFPROFIL, NEFABS.              TAPE20, BIGPENPLOT, NASAPLGO
PURGE,A,NEFPROFIL,ID=PUWS.
PURGE,B,NEFABS,ID=PUWS.
PURGE,C,TAPE20,ID=PUWS.
PURGE,D,BIGPENPLOT,ID=PUWS.
PURGE,E,NASAPLGO,ID=PUWS.

#              END OF INFORMATION
```

DUMP FILE to BACKUP for Blast Noise Program

```
PWSVP,CM160000.T1000,P4.
CHARGE,PUWS,1189056841,RS,I.


COMMENT. PROCEDURE TO BACK UP NEF FILES ON TAPE.
REQUEST,TPEOUT,MT,HY,RING,VSN=CK0758.  REQUEST BACKUP TAPE.
COMMENT, ATTACH PERM. FILES IN PREPARATION FOR TAPE DUMP.
ATTACH,T2,NEFPROFIL,ID=PUWS.
ATTACH,T3,NEFABS,ID=PUWS.
ATTACH,T4,TAPE20,ID=PUWS.
ATTACH,T5,BIGPENPLOT,ID=PUWS.
ATTACH,T6,NASAPLGO,ID=PUWS.
COPYBF,INPUT,TPEOUT.                           MAKE TAPE DESCRIPTION 1ST FILE
COPYBF,T2,TPEOUT.
COPYBF,T3,TPEOUT.
COPYBF,T4,TPEOUT.                              DUMP FILES TO TAPE.
COPYBF,T5,TPEOUT.
COPYBF,T6,TPEOUT.
REWIND,TPEOUT.
REVERT.
&
TAPE DESCRIPTION:
---- -----------
FILE# NAME          DESCRIPTION AND FORMAT
----- ---------- ----------- --- -------
  1   TAPEDESCRB  THIS FILE - CARD IMAGES
  2   NEFPROFIL  PROCEDURE TO RUN NEF PROGS - CARD IMAGES.
  3   NEFABS     SEGMENTED BINARY NEF PROGRAM.
  4   TAPE20     NEF DATA FILE - BINARY
```

```
  5   BIGPENPLOT PLOT SUBROUTINE - RELOCATABLE BINARY.
  6   NASAPLGO   NASA CONTOUR PROGRAM - RELOCATABLE OVERLAYED BINARY.
NOTE:  ALL FILES MAY BE RECOPIED TO DISK USING COPYBF.
#              END OF INFORMATION
```

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